AGRICULTURAL RESEARCH SERVICE

CONFERENCE ON UPPER RESPIRATORY DISEASE AND THE MUCOSAL DISEASE COMPLEX IN CATTLE

Denver, Colorado
July 29 - 30, 1955

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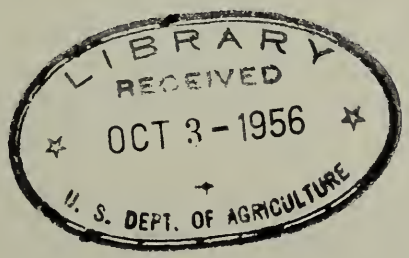

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A conference on Upper Respiratory Disease in the Bovine was held at the Animal Disease Research Laboratory, ARS, Denver Federal Center, Denver, Colorado, on Friday, July 29. The meeting was called to order by the Chairman at 10:00 a.m.

Dr. Van Houweling:

Gentlemen: We are indeed grateful to all of you who came to this meeting. We certainly appreciate the response to our invitation—a rather hurried call—for this meeting, and I think we are extremely fortunate in having the fine talent that is gathered here today. I want to express our appreciation to Dr. Davis and his staff for the fine arrangements—the excellent conference room and all the facilities—that have been made for us.

I might explain just how we assembled this group. There was a little bit of reason to it—we didn't just reach into a hat and pull out a lot of names. We knew of certain states where this respiratory condition, if we can call it that for the time being, had been recognized and diagnosed, and we felt that those states certainly should be represented by the investigators as well as the state and federal officials. So that was one group that was invited. Now we also knew that the Mucosal Disease meeting in Purdue had ended up with the Committee, the continuing Committee being appointed, and we felt they should certainly be here to bring us the information on that condition and to see if there was any connection between the two, and bring those aspects together. That is about the way we arrived at the group assembled here, except for a few of us from the Department of Agriculture who are also concerned with this problem.

We hope that with the rather busy schedule we've outlined for today we can bring to light a great deal of information on these various conditions that hasn't all been assembled at one time before and, at the latter part of the conference, to come up with some conclusions and recommendations as to what should be done in the future. This group and every one else concerned would like to bring as hasty a solution to these problems as we possibly can. That is the purpose of this meeting—a fact finding meeting. We think we have the folks here who have the facts and we want to get them all recorded together.

You will notice in the agenda that there is a plan for a field trip tomorrow. Dr. Davis and Dr. Schaulis have made arrangements to see some field cases, and also have arranged with Dr. Brown for an autopsy of a field case. The details of this trip will be presented to you later as the meeting develops.

The first item we have on the agenda is a discussion of mucosal disease as seen in Iowa by Dr. Ramsey.

Dr. Ramsey:

Ramsey and Chivers, in 1953 reported a disease condition which they encountered at Iowa State College for the first time in January 1951. Since then, a series of animals with similar symptoms has entered the Veterinary Clinic, coming from all parts of Iowa. This condition has been seen predominantly in Hereford and Angus cattle, but it has been found in Shorthorn, Holstein, and Guernsey breeds. Most of the animals have been between 6 and 14 months of age. However, 4 have ranged from 3 to 5 months of age and 7 from 18 months to 7 years of age. Altogether, cattle from 75 affected herds have been admitted to the clinic. Animals with the same condition from 22 additional herds have been necropsied at the Iowa Veterinary Diagnostic Laboratory. The seasonal incidence has been greatest in winter and early spring, especially in the months of February and March, but it has occurred in every month of the year. The morbidity rate varied from 2 to 50 percent in different herds. The mortality rate was above 90 percent. Usually the disease did not recur on the same farm during succeeding years.

A review of available veterinary literature did not reveal a description of a disease comparable in all respects to the condition described in this paper. The disease has many of the characteristics of bovine hyperkeratosis, New York virus diarrhea, Purdue virus diarrhea, bovine malignant head catarrh, and ulcerative dermatitis of calves as described by Gibbins of Alabama.

The onset of this disease, as described by practitioners, apparently began with an initial elevation of temperature to about 106° F. which lasted for two or three days and then usually dropped quite rapidly to nearly normal. The majority of the patients had been sick for three to seven days when first observed in the clinic and no temperature elevation was found at that time. There was almost complete anorexia from the onset. Other symptoms varied according to the location of the lesions, but a constant or intermittent watery diarrhea, sometimes mixed with blood, was seen in practically all cases. Prior to death, many of the animals made frequent attempts at defecation, often accompanied with violent straining but passed only small quantities of mucus. Emaciation, dehydration, depression, and often salivation were noted. Slight opacity of one or both corneas and increased lacrimation were noted in ten herds of cattle. There were no central nervous system symptoms and the sick animals could be induced to get up and move about until near death. In about two-thirds of the cases the course of the disease was from five to fifteen days and from twenty to thirty days in the rest. An examination of the nostrils, muzzle, lips, gums, tongue, and oral cavity usually revealed erosions and ulcerations of varying sizes and shapes. A foul-smelling, mucopurulent exudate was often observed hanging from the nostrils and muzzle.

The pathological alterations in this disease varied considerably, but the lesions were primarily erosive, ulcerative, and cystic in nature and were confined principally to the lamina epithelia and the mucosa of the alimentary canal. The acute inflammatory cell infiltration that would be expected to accompany severe gross lesions was not always found on histopathological examination. Hyperemia and hemorrhage were common findings, but marked leukocytic infiltration was often strikingly absent.

Description of Lesions (illustrated)

Head: Corneal opacity occurred in about 10 percent of the affected herds. The opacity started from the center of the cornea and extended peripherally, and in these animals there was considerable lacrimation. The muzzle, including the lips, usually contained erosions and ulcerations of varying sizes and shapes and appeared dirty. The mucosa of the oral cavity showed extensive loss of epithelium. There is marked hyperemia of the submucosa with very little associated mucopurulent inflammatory exudate. The dorsum of the tongue is often denuded of epithelium to the extent of 75 to 80 percent in some animals. Lesions are also found on the lateral and ventral sides of the tongue.

Esophagus: The lesions in the esophagus are variable in degree from a few superficial erosions to numerous erosions and ulcers. Usually the erosions are linear.

Rumen: In about 10 to 20 percent of the cases the rumen will show numerous lesions, especially on the pillars. They are usually erosive in character but hemorrhagic foci are oftentimes present. Ingesta would tend to adhere to the mucosa.

Abomasum: In 75 to 80 percent of our cases, the rumen, especially the fundic part, exhibited lesions. They were usually 1-15 mm. in diameter and were often surrounded by a distinct halo. Other times, they would be sharply delimited with petechial hemorrhages. The pylorus of the abomasum may show catarrhal to ulcerative to hemorrhagic inflammation. It should be pointed out that the lesions of the abomasum are often quite small and may be overlooked if not carefully examined.

Intestine: The primary lesion is a catarrhal enteritis, with lesions being focalized primarily in the Peyer's patches. Here the inflammatory changes may progress to necrosis and sloughing. The duodenum, jejunum, ileum and colon are affected in quite the same manner and the lesions may be variable as in the abomasum. Not infrequently, there is considerable blood in the intestinal tract which prompted a diagnosis of coccidiosis in some instances.

Other organs: Aside from the pathological changes of the lamina epithelia and the mucosa of alimentary tract, there were no significant changes in the visceral organs. The lung and kidney were essentially normal.

The liver in most instances showed no gross evidence of damage. An occasional case, however, revealed central lobular degeneration. The heart quite often showed hemorrhages on the epicardial surface which lead to a field diagnosis of hemorrhagic septicemia by some practitioners.

I would like to emphasize that we have never said that this was a new disease entity. I am still trying to fit it in with some known disease syndrome. Whether or not I will be able to do so remains to be seen. We

have seen 25 herds with this condition since the first of this year. It definitely does seem to be on the increase in Iowa. Some veterinarians in Iowa have not seen any cases; others have had as many as 7 or 8 herds with this condition.

Dr. Van Houweling:

Do we have any questions?

Dr. Jensen:

Except for the ruminal pillars, are there any special areas in the rumen that seem to have a higher incidence of the lesions?

Dr. Ramsey:

No, I would say that the greatest incidence is on the pillars, followed by the larger sacs of the rumen. The incidence of the lesions of the rumen and omasum are about the same--that is, in about 10 to 20 percent of the cases. Lesions are regularly found in the abomasum. Could these be lesions of what some refer to as the acute form of hyperkeratosis? Some people who have worked with hyperkeratosis that have seen mucosal disease feel that I'm foolish to entertain such a thought.

Grossly, there is very little thickening of the skin that we can detect, but from these animals that dehydrate and emaciate rapidly, we do see drying of the skin, but no marked thickening of the skin.

Dr. Van Houweling:

Gentlemen, there is a man in the room that we should recognize--N. J. Miller from Eaton, Colorado, a practitioner. Doctor Miller, we're very glad to have you here, sir.

How about any other questions for Dr. Ramsey?

Dr. Marsh:

I would like to ask whether lesions in the feet occur in your cases of mucosal disease?

Dr. Ramsey:

In 10 herds out of 75 that we observed carefully, lameness and some lesions, interdigital lesions, were found.

Dr. Marsh:

The foot lesions in our cases consisted of crusted exudate on the skin just above the coronary band, and a dermatitis between the dew-claws and the heels, similar to "grease-heel".

Dr. Ramsey:

These have been primarily interdigital lesions and not every animal on the same farm was similarly involved. Were all yours? In the same herd?

Dr. Marsh:

The foot lesions were observed in several herds.

Dr. Ramsey:

Showing lameness?

Dr. Marsh:

Yes.

Dr. Van Houweling:

Thank you very much, Dr. Ramsey, for an excellent discussion.

I'm sure Dr. Ramsey's presentation and discussion speak amply for him, and now we should have the Purdue story. What I believe they are now calling Purdue viral diarrhea has been commonly called mucosal disease in Purdue, and there is some similarity between the conditions, I'm sure.

We will hear from Dr. Pritchard of Purdue University who has done a great deal of work on their condition. Is this Purdue viral diarrhea, Dr. Pritchard—is that the current nomenclature?

Dr. Pritchard:

I believe we might call it virus diarrhea-Indiana or Indiana virus diarrhea.

During the last 20 months, we have run into many cases of a disease syndrome in Indiana which involves the respiratory and digestive system of cattle. It is, we believe, new to Indiana. The first cases occurred just north of Lafayette in some of our large feeder herds, and for about 6 months almost all of our cases appeared from that area. Since that time, cases have appeared from almost every part of the State. This disease very closely resembles virus diarrhea-New York, the disease described by Olafson in 1946. It also rather closely resembles the disease described by the Swedes, epizootic enteritis, which appeared around 1946 and was reported shortly after that time. It does, in many respects, also resemble mucosal disease as Dr. Ramsey has described it to you. It also has some of the characteristics of bovine malignant catarrh. We don't know exactly how it should be classified, but we feel that because it does resemble New York virus diarrhea so closely clinically, we do, at the present at least, consider it to be either that disease or a disease that is very similar to it. We have reproduced this disease in its entirety with many different materials but we can reproduce it with ease with blood. Every aspect of the disease has been reproduced in the laboratory.

The signs and symptoms of virus diarrhea-Indiana are quite similar from herd to herd although cases vary considerably in severity and in the duration of the disease. In general, the disease is rather severe, but once in a while a rather mild form occurs. The mild form occurs more often in very young calves and in some of the more aged cattle. It appears that animals between 6 months to 2 years of age are the most susceptible to this disease, if the severity of clinical signs is an adequate criterion for susceptibility.

The onset is sudden and is characterized by depression, a high fever, generally 104° to 105°, perhaps as high as 108°, a very rapid heart rate and rapid respiration. In most of the herds, you can tell animals are coming down very early because they are markedly depressed and segregate themselves from the rest of the herd. Within several days, they develop a nasal discharge.

In many instances, the discharge is rather voluminous and sometimes it covers the entire muzzle and, sometimes, it may hang down completely to the ground. In other instances, the nasal discharge is not marked. After about 3 or 4 days, the nasal discharge becomes thick and viscid. At about the same time that the animals develop the nasal discharge, they also develop a low, hard, dry, non-productive cough. One can hear a hack from one animal in a herd; shortly, from another animal--and another. On postmortem, one finds a thick viscid exudate in the trachea and bronchi.

Very early in the course of the disease, mouth lesions appear. These lesions are circular, reddened areas or superficial erosions and occur most frequently on the dental pad, the margins of the lip, and the sides of the tongue.

Another rather striking clinical finding in this disease is lameness. This lameness appears to be due to laminitis. When the animals move, they have a propensity to walk on their heels. They walk very carefully and exhibit evidence of much pain. They prefer to lie down, and we have trouble making them move. Lameness or laminitis is seen in about 10 percent of the affected animals. Some cases are not as pronounced, but rather characterized by stiffness. Lameness generally will appear early in the course of the disease, and the animals will be lame for 2 weeks--3 weeks--sometimes longer.

One of the most characteristic clinical signs of this disease is diarrhea. During the early course of the disease the feces are very hard, but often contain specks of blood on the surface and sometimes mucus. After the incubation period, generally between a week to 2 weeks after the onset, the feces become very fluid and light brown in color; generally they contain a lot of mucus and rather large quantities of blood. Early in the course of diarrhea, the mucus is usually found in thick strands. One can take a stick and put it through the feces and pull out long strands of thick, heavy mucus. Later in the course it becomes very fluid, rather like egg albumen.

The morbidity rate in this disease has been rather high. Very early, we thought it was about 100 percent. Now we wonder perhaps, if it isn't a little bit less than 100 percent in some herds. The mortality rate is rather

low, and generally will vary somewhere between 0 to 20 percent. Very recently, we've had cases where the mortality rate has exceeded 50 percent, so maybe our original data are not completely accurate in the case of mortality rates. The course of the disease is usually 4 to 6 weeks within a herd. Sometimes it remains in a herd much longer. Some of the animals in these herds, however, may have diarrhea for much longer periods of time.

In some of the severely affected animals, the weight loss is tremendous. A 1000-pound animal sometimes loses 250 pounds or more of body weight during the acute episode of infection. Many of them become very much dehydrated, of course, after diarrhea, and their skin does resemble what Dr. Ramsey told you about in his cases of mucosal disease.

In the milder form that I mentioned earlier, we don't see the striking clinical signs like I've shown you in the acute form. In the mild form, about all we see is a rather moderate increase in temperature, 103° to 104°. The animals are rather unthrifty. They don't do too well, they don't eat too well. Some develop moderate diarrhea, but that is not characteristic, and we've seen it only in a relatively small percentage of the cases.

We were able to obtain very little evidence on the way this disease was spread. Generally, in outbreaks in any particular herd, we could not find evidence of either direct or indrect contact between herds. In many instances, however, the disease did follow the introduction of new animals or passage of animals through a sales barn or a public stockyard. We have had quite a number of cases of that nature.

The most marked pathological changes of this disease are congestion, hemorrhages and erosion of the mucosa of the digestive tract. The changes occur or may occur any place along the entire digestive tract, but they are by far the most marked in the abomasum and the small intestine and probably secondly in the esophagus. The characteristic change is a rather superficial type of lesion and hemorrhages spread throughout the mucosa, and the lesion in the small intestine is rather characteristically a catarrhal type of enteritis. In many of these cases that die very soon after they become involved, you find very slight pathologic changes. It is amazing how some of the animals become ill and die and so few lesions are found. But in these cases, the character of the lesion is the same as it is in those that live longer and the lesions develop more markedly.

Histologically, there is marked loss of surface epithelium and petechial hemorrhages and hyperemia. The most striking change is the loss of surface epithelium in these cases. In many animals there is marked edema of the lymph nodes and sometimes also edema of the abomasum and of the small intestines, but I think more often edema of the lymph nodes.

In some cases we have found recurrences of the disease after animals had recovered from one episode of infection. In one herd, we found 2 separate occurrences in a period of 9 months. This was a rather large herd for

Indiana. It had 187 head of cattle in it. Another herd had a reoccurrence one time, and this herd was comprised of about 120 head of cattle. These reoccurrences in both herds occurred at about 4 months after the animals had recovered from the original infection.

In regards to treatment, veterinarians in Indiana have treated cases with most of the antibiotic sulfanomides that are presently available for clinical use, and in no instance did they find that treatment helped these conditions at all. Some of the clinicians felt that the treatment did prolong life somewhat, and, perhaps in the long run, mortality was somewhat reduced because of the lower incidence of death from secondary causes. That is an observation made by some of our clinicians.

The only remarkable hemologic change that we have found in this disease is leukopenia, which occurs at the time of the febrile period. The white blood count may be 1,000-2,000 per mm.^{3}. Within 2-4 days, the count rises to a normal or somewhat elevated level. When diarrhea appears, the leukopenia often reappears. During the second occurrence of leukopenia, a relative lymphocytosis is often found. The percentage of lymphocytes in the blood smear is generally very high in that second period.

We have been able to reproduce every aspect of this disease with blood from infected animals. We've also reproduced it by direct and indirect contact. We have inoculated sheep, guinea pigs and mice, but have not induced the disease in these species. At the present time, Dr. Carlson has made 30 rabbit to rabbit passages, and the agent has remained pathogenic to calves. That work will be continued. Dr. Moses has not succeeded in adapting the agent to embryonated eggs at present, although we haven't given up completely in that respect. We conducted cross-protection tests with the New York strain of virus diarrhea and have some preliminary evidence, at least, to indicate that the diseases are different immunologically. We've also conducted cross-protection tests with an agent that we had used to reproduce mucosal disease and find the same results. We have completed some duration of immunity studies with a homologous agent and find that immunity disappears, as far as we can tell, after about 4 months. We are presently completing these studies. We've conducted a few studies on sensitivity to antibiotics in vitro and have found that penicillin or streptomycin do not seem to affect the agent.

Dr. Van Houweling:

Thank you very much, Dr. Pritchard for another good discussion. I think we might take a moment or two for questions or a little discussion on Dr. Prithcard's presentation now.

Dr. George:

Can the disease be transmitted by animal inoculation?

Dr. Pritchard:

Yes.

Dr. Chow:

Do you find any kind of pathological changes in rabbits?

Dr. Pritchard:

No, we found no pathologic change in the rabbits, no symptoms, no blood changes. We ran a complete blood count on the first 15 passages.

Dr. Chow:

What material did you use?

Dr. Pritchard:

We used blood.

Dr. Chow:

Did the rabbits have any kind of body temperature reaction?

Dr. Pritchard:

No consistent reaction. Generally, they would get a little rise but we didn't think it was of particular significance.

Dr. Mulhern:

What type of cattle did you find affected in Indiana?

Dr. Pritchard:

Most of the cattle affected in Indiana are beef cattle, mostly Herefords. We found it in many breeds, however, including the dairy breeds. Probably most of the breeds were affected.

Dr. Mulhern:

Not many abortions?

Dr. Pritchard:

No, I guess that I didn't mention that in our dairy herds there is a marked reduction in milk production during the acute stage. It is a very serious loss. We've never seen any abortions in pregnant animals that have been affected either during or following the infection.

Dr. Davis:

Dr. Pritchard, do you make your reproductions at any stage of the disease?

Dr. Pritchard:

We have recovered the agent 23 days after inoculation. That was some of our early work. We haven't been able to do any more on it.

Dr. Van Houweling:

The next item of discussion on our agenda here is the upper respiratory disease as seen in California. We're very fortunate to have Dr. McKercher from the University of California, Davis, California here with us. We'll be glad to hear from you now, Dr. McKercher.

Dr. McKercher:

An account of the acute upper respiratory infection of cattle which has been encountered in California was given at the mucosal disease conference at Purdue last February. I would now like to summarize the material that was given at that time and to bring you up to date with the experimental work that we have conducted on it since then.

In October of 1953, a disease of cattle characterized by acute respiratory symptoms was first observed in dairy animals in the Los Angeles area. It spread to neighboring counties and considerable economic loss was experienced, mainly from the point of lowered milk production, although there were some deaths. By February of 1954, the disease apparently died out. However, what was believed to be the same condition appeared in several large feedlots in California during the fall of 1954 and in dairy cattle in the Los Angeles area. However, the severity of the infection seemed to diminish in the latter type animal whereas, for the beef breeds, it increased. Contrary to our first year's experience when the disease died out after several months, it has continued to occur intermittently in feedlot cattle for almost one year. A few sporadic outbreaks have been reported during this time in dairy cattle, assuming for the moment that we are dealing with the same condition in each case.

The morbidity varies considerably. In the initial outbreak in dairy cattle it ranged from 20 to 60 percent, but in subsequent outbreaks it was much lower. In beef cattle, the morbidity varies between 5 and 30 percent. The mortality in the dairy type animal was relatively low, varying from 1 to 5 percent, depending on the outbreak, whereas in beef stock, it is considerably higher.

Symptoms: The cessation of milk flow is the first indication of illness. This is followed within 12 hours by salivation and by a serious nasal discharge. The salivation and the nasal discharge are the first symptoms that are observed in beef animals. In the early stage of the disease, the temperature is quite high in both types of animal. Temperatures from 107° to 108° and even higher are not uncommon. There is a certain amount of respiratory distress and the breathing is rapid and shallow. Animals that

recover usually begin to do so at this point. Others may progress into the chronic stage. Animals that become chronic display n increased amount of nasal discharge which becomes quite mucopurulent and fetid accompanied by marked respiratory distress. This is indicated by wheezing and by the fact that they resort to open-mouth breathing with the head extended. We have consistently checked the white blood cell count of animals in various stages of the disease and have never detected a leukopenia. Neither have we observed diarrhea nor any pathological changes in the mouth, at least by superficial examination of the living subject.

Despite the fever and respiratory difficulty, the animals do not appear particularly ill.

Unusual or inconstant clinical symptoms that have been observed include lameness, posterior paralysis, and a certain amount of conjunctivitis and, in some cases, ocular involvement. We have not had an opportunity to determine whether abortion occurs because of the absence of pregnant animals in feedlots and in the type of operations in Los Angeles where the disease occurred in dairy cattle. We have not, however, observed this infection in young calves although again, this might be due to the fact that there were few or none on the premises where these outbreaks occurred.

Pathological Findings: No changes can be detected in the living subject by casual examination of the mouth, but on deep examination one can detect hyperemia and necrosis of the laryngeal mucosa, even in animals in the early stages of the infection. It is our impression that most animals showing this degree of early pathological change die during the acute stage of the disease.

A few animals were sacrificed early in the disease for pathological study but most of our studies were conducted on fatal cases, hence the picture may be rather exaggerated. In cases which terminated fatally, the nasal mucosa was quite congested and the larynx was edematous and hemorrhagic. There was hemorrhage also in the mucosa of the trachea. A thick cheesy exudate was present between the turbinate bones. It was distributed in a patchy manner over the mucosa of the larynx and, to a certain extent, of the trachea. When this material was removed, it left a raw, hemorrhagic underlying surface. Early cases at autopsy showed much the same type of change but to a much less marked degree. Early cases that we examined showed little or no evidence of pneumonia. In most of the fatal cases, however, autopsy revealed quite a severe pneumonia involving essentially the apical lobes, in which abscesses were sometimes present. There was a considerable amount of red hepatization, and the bronchi contained gross amounts of a serofibrinous exudate.

Histopathologically, there is nothing characteristic of this disease or nothing to indicate whether it is of a viral or bacterial etiology. Inclusion bodies, however, have not been observed.

Treatment: A great variety of therapeutic measures have been used but without uniformly successful results. Some report one form of treatment as having a beneficial effect; others report something else. This fact in itself would indicate that there is no successful cure. Antibiotics undoubtedly control the severity of the chronic form of the disease since bacteria are of primary significance at this time. Favorable reports on relief of the nasal congestion by means of trypsin and other enzymes have been made. As a prophylactic possibility, experiments involving the feeding of antibiotic-containing rations are currently in progress. Results of these studies are not yet available.

Experimental Studies: The first object in doing experimental work was to determine if the condition was infectious and, if so, to identify the material containing the etiological agent so that rational attempts at isolation could be conducted. Preliminary attempts gave uniformly negative results. We did determine during the course of this study that animals which could not be infected with the respiratory disease entity were subsequently found to be susceptible to virus diarrhea (VD). We assumed, therefore, that if the respiratory disease was, as some thought, virus diarrhea or a form of it, the animals would have become infected on exposure since they subsequently were established as being VD susceptible.

It was realized that the circumstances under which the transmission studies were conducted left much to be desired. All the outbreaks occurred quite some distance from Davis, and we had to depend on veterinarians in the area to obtain materials and to ship them to us. The only material that was practicable to forward under these circumstances was blood, and hence, in our initial transmission attempts blood was used almost exclusively, although we realized that there was a greater likelihood of the agent being present in some other material. On one occasion, we obtained nasal scrapings from what was considered to be an early case of the disease, but this material likewise proved non-infectious when instilled nasally in half-grown steers and heifers.

The obtaining of more suitable field materials for transmission studies was facilitated by first establishing better liaison between the farmer, the local, state, and federal veterinarins and ourselves so that whenever an outbreak was reported we were immediately alerted. We were thus able to reach the area in the minimum of time and while some of the animals were still in the very early stages of the disease. We felt it very important that specimens (nasal washings and blood) be obtained from early febrile cases only. Nasal washings were obtained in the following manner: A stabilizing fluid was used to flush out the nasal passages, and the washings were collected in a pan which was held under the animal's muzzle. Since we collected specimens from febrile cases only, we usually checked with the manager of the feedlot several days later to find if the animals from which specimens were obtained had developed the infection in the meantime. We also obtained whole blood which was defibrinated. As soon as collected, these materials were put in pyrex ampules, sealed by flaming, and the contents rapidly frozen in a dry ice-alcohol mixture. The tubes were then stored in dry ice and taken back to the laboratory.

In order to ensure, insofar as possible, that the experimental cattle used were susceptible, we contracted with certain farmers around Davis whose herds are under the observation of members of our clinic staff, to raise calves for us. These calves were taken to the University farm when about two months of age and held in isolation until needed for experimental work. They were checked daily for any clinical evidence of infection and the temperatures taken during the holding period.

At this time we did not know whether the infectious material was blood or nasal secretions, or whether infection results from the synergistic effect of two agents, one of which was in the blood and the other in the nasal secretions. Moreover, an atypical Pasteurella had been consistently recovered from the tracheas of affected cattle which strongly suggested that this agent might be the cause or at least play some part in the etiological picture. In our initial experiment on transmission, we therefore included the Pasteurella culture. Calves were inoculated as follows: Some with nasal washings only, others with blood only, and one with the Pasteurella organism. The nasal washings and the culture were sprayed into the external nares with an ordinary fly sprayer, while the blood was injected intravenously and intramuscularly. The rest of the calves in the experiment received combined inocula consisting of nasal washings and blood; and nasal washings, blood, and Pasteurella culture.

The results were rather interesting in that all the calves which received the nasal washings, either alone or in conjunction with other materials, exhibited a marked febrile reaction within 72 hours. These animals displayed a nasal discharge, drooling, and had difficulty in breathing. It was observed that the animal that received the Pasteurella culture developed much the same clinical symptoms, although the reaction was delayed. The animals that received blood alone remained normal. On the basis of these results, we felt that we had succeeded in reproducing the infection with nasal washings, although it varied considerably from the field condition. The use of blood inocula was thereafter discontinued. On subpassage of nasal washings which were collected during the early febrile stage, the infection became increasingly severe, although none of the calves died.

In an effort to elucidate the nature of the etiological agent, a Seitz filtrate of nasal washings was inoculated intranasally in two calves. A high temperature was produced in one of the calves but only in the afternoon, the morning temperatures being essentially normal. In the second attempt to circumvent the bacteria, nasal washings were treated overnight at 4°C with penicillin and streptomycin (5000 units penicillin and 200 micrograms of streptomycin per ml., respectively, of nasal washings). The sterility of the treated material was carefully checked by cultural methods, using aerobic and anaerobic procedures. On rare occasions, a mold growth was obtained since a mycostatic agent was not used to suppress the growth of these organisms. However, the presence of these organisms was not considered significant. On intranasal spray inoculation of this treated material into calves, the same clinical syndrome was produced as with the untreated washings. It thus appeared that the etiological agent was a virus.

In keeping with field observations, we have not observed diarrhea or lameness, nor any type of erosion on examination of the mouths of experimentally infected animals.

At autopsy of experimental cases we found a considerable amount of inflammation of the nasal mucosa, the turbinate bones were quite congested and covered with a cheesy exudate. The changes in the larynx were not particularly marked although hemorrhages were sometimes found. Hemorrhages were also occasionally found in the trachea which, in addition, contained varying amounts of serofibrinous exudate. In most cases it was not organized to any extent. The lungs were always normal, both grossly and on histopathological examination.

We feel that we have reproduced the infection in calves although thus far we have not used adult animals as experimental subjects.

A very intriguing question was whether the respiratory disease in dairy cattle in California is the same as the disease in beef animals, with the opinion being equally divided. Some felt that two distinct conditions were involved, others that we were dealing with the same condition in each case, with the difference being simply in degree of severity.

At the first opportunity, therefore, we obtained nasal washings from an outbreak of the respiratory disease in dairy cattle in Los Angeles in the manner already described. Calves were then inoculated with untreated materials and the clinical and febrile responses noted.

Clinically, and from the point of view of the thermal response, it would appear that we are dealing with the same condition in beef cattle as in dairy animals. However, further work is indicated for final confirmation.

Plans for future work include attempts to determine if recovered animals develop an immunity following infection. Should this be the case, it will be possible, by means of cross-protection tests, to determine relationship between outbreaks in the beef cattle in various parts of California, and possibly in other states where a clinically similar type of disease has been reported.

We are currently attempting to recover the etiological agent from nasal washings of infected calves and from field cases of the disease by mouse, egg, guinea pig, and tissue culture inoculations. We treat the inocula with antibiotics when necessary. Thus far we have nothing of a positive nature to report from this phase of the study.

In conclusion I should like to mention the single instance when we might have encountered a case of mucosal disease in the course of our studies on the respiratory condition. Two 6- to 8-mouth-old Hereford steers were brought to the clinic of the veterinary school with symptoms suggestive of virus diarrhea, i.e.: diarrhea, depression, peeling of the skin of the muzzle, and ulcers on the lips and tongue. The temperatures were low (in the neighborhood of 102.5°F). White counts were rather elevated which was

not surprising in view of the marked dehydration which these animals were exhibiting. Histopathological examination suggested a resemblance to Ramsey's descriptions for mucosal disease.

Several weeks later an animal from this herd developed a high temperature (107.3°F) and blood was obtained at this time. On inoculation into calves, it produced absolutely no response. On this basis it was concluded that the condition was not virus diarrhea, although the epidemiology of the outbreak was characteristic for both virus diarrhea and mucosal disease. Only eight animals out of a total of 1800 were affected, but of these eight, seven subsequently died. This pattern differs greatly from that of the respiratory disease discussed earlier in this presentation. However, no further cases were reported, either from this or other herds in the State.

Dr. Van Houweling:

Thank you, Dr. McKercher, for a very excellent presentation.

We are very pleased to have Dr. Jensen of Colorado A & M at Fort Collins here to present the studies that have been made of this condition that is now called infectious rhinotracheitis in Colorado. Dr. Jensen, we'll be glad to hear from you.

Dr. Jensen:

This disease which we designate as rhinotracheitis at this stage is defined as an acute infection of the anterior respiratory tract, and from what Dr. McKercher has just said, I suspect that we are dealing with the same disease. This disease has been known by other terms, such as "red nose"--a local term used by farmers, "rhinitis", "necrotic rhinitis", and "upper respiratory disease". This was first recognized in 1950. Since that time the disease has increased in incidence annually until 1955 when it was a disease of major and first importance in the feed lots of Colorado. It was of such economic importance that it stimulated the organization of the cattle feeders into what is known as the Colorado Cattle Feeders Association. That Association has employed Dr. W. W. Brown to work specifically with the college on this project.

At the College, several people are now contributing to this study, and, being close to the site of this meeting, we have the advantage of being able to bring those people with us, so that rather than my using the entire time of this discussion, we have asked that the 30 minutes be broken into three 10-minute periods. Dr. Brown will discuss the symptoms and distribution in the State; I will present the pathology; and Dr. Chow will present the experimentation that has been conducted.

Dr. Brown:

The symptoms that we see in this condition in Colorado begin primarily with a profuse nasal mucoid discharge which is usually blood tinged. The temperatures range from 103° to 108°, and there is also a very deep bronchial cough, with excessive salivation. The salivation and the nasal discharges

may run together and drip off of the chin. There is a very severe inspiratory dyspnea accompanied with mouth breathing, and a wheezing sound. We also see an inflammation of the nasal mucosa. Animals lying down will extend their head and lay their chin out on the ground, and they will show uneasiness in other ways. They'll rest like that for a while, and then they'll turn their heads back into their flank.

Some cases will develop a fetid, yellowish diarrhea, but this is an inconstant symptom.

Abortions may occur in pregnant heifers.

There is severe dehydration with weight losses up to 200 pounds. The affected animals will recover in from 2 to 7 days if they do not develop any complications.

The course in a herd will vary. In one type, Type A we'll call it, the disease develops simultaneously. That is, all the animals that are going to break, break at one time. The morbidity rate is quite variable in different outbreaks.

In Type B, the disease develops sequentially, that is--a few animals will break today, skip a few days--then one or two more. It will go on like that, and it can last in the herd up to 30-45 days.

The morbidity rates fell into two groups. Group I is a survey that has been made at 34 feed lots with the animals broken down into the different age groups. In Group II--that is one large feed lot, we do not have a breakdown into the age groups, but it is significant in our total survey. In Group I, morbidity is running about 25 percent, with mortality 1.9 percent. In Group II, our morbidity is 8.7 percent, with a mortality, which has jumped a great deal in this one particular feed lot, of 6.3 percent. Combined, that is 17 percent morbidity, with a total mortality of 3 percent.

We have reports that the disease exists in Wyoming, Arizona, and Nebraska. It has been confirmed in Idaho by tissue samples that have been sent in. We also have reports from practicing veterinarians of this condition in dairy cattle. There was one necropsy at the College this past week that showed typical symptoms of rhinotracheitis.

At the time of this report the disease is confined principally to Northeastern Colorado. In this general area, there are approximately 425,000 cattle fed, and in the past year, we have had around a 10 percent incident of the feed lots. In the Greeley and Eaton areas, the practitioners report close to 50 percent occurrence in the feed lots of that region.

Another phase of the mortality is that in one particular lot of aborted heifers, there was a 50 percent death loss, and these aborted heifers are very difficult to treat.

Dr. Jensen:

We will now consider the pathology of the disease as we see it in Colorado.

The pathologic changes observed by us are limited entirely to the respiratory system. To begin with, on the muzzle we find considerable hyperemia, from which the term "red nose" is derived. The major changes are found in the nasal cavity where the mucous membrane is severely congested. Occasionally, a few hemorrhages are encountered. The outstanding and conspicious finding is an exudate which is loosely attached and is composed of mucus, pus, and fibrin with the latter being minimal in amount. When this exudate is removed mechanically, most of the underlying mucous membrane is intact and there is very little ulceration or necrosis. The exudate in some cases is so voluminous and tenacious that it tends to occlude the lumen, and we believe contributes to the difficulty in breathing. Histopathologically, the tissue simply showed a congested hemorrhagic mucosa with an occasional point where the epithelium was eroded. Microscopically, many morphologic types of bacteria were in the exudate. As Dr. McKercher said for California, we also are not able to find inclusion bodies.

The mucosa of the pharynx is congested and hemorrhagic and the submucosa is edematous. The surface contains an uneven detachable deposit of mucopurulent exudate. The underlying epithelium is intact. The reaction has been seen extending for a short distance into the eustachian tubes. The larynx is not always affected, but in some cases may show multiple foci of necrosis and inflammation. Some larynges show the complication of calf diphtheria. The mucosa of the trachea shows variable degrees of involvement depending on what stage of the disease the animal is examined. The trachea of an animal which was euthanized in the early stages of infectious rhinotracheitis showed multiple foci of hyperemia and hemorrhage of the mucosa with some mucopurulent exudate on the surface. In an animal dead from the natural course of the disease the entire mucosa of the trachea was covered with a thick deposit of mucopurulent exudate containing fibrin and blood. Much of the epithelium had been destroyed, and the subepithelial tissues are edematous and congested. The large amount of exudate reduces considerably the effective lumen of the trachea. Such cases present the danger of bronchopneumonia and pulmonary abscesses as a result of inhalation of detached fragments of exudate.

Dr. Brown:

I failed to mention that in the feed lots here in Colorado, these cattle have been on feed for 30 days to 5 or 6 months, getting basically the same ration. Is there any difference in length of time on feed when they come down in California?

Dr. McKercher:

The time varies from 15 days to a month in California. Cases are in animals brought into the feed lot and held for that period of time. Animals held longer do not differ. The majority of animals become susceptible after they have been held 2-3 weeks.

Dr. Monlux:

I would like to ask Dr. Jensen if Graham's report of the Pathology of Shipping Fever in Feedlot Cattle in the American Veterinary Medical Association Journal in 1953 did not include descriptions of many cases of what is now called rhinotracheitis? Isn't this new disease really one of the group of old diseases which we formerly called the shipping fever complex?

Dr. Jensen:

At the time Dr. Graham was making his study, several cases of rhinotracheitis were encountered. In 1946, Davis, studying calf diphtheria, observed the same type of lesions in many of his cases. We believe that rhinotracheitis existed at that time and was included in the category of shipping fever complex

Dr, Mulhern:

I have a question to Dr. McKercher. The temperature appears to remain constant. Under field conditions, it progresses to a certain point, then goes down. Under what point does that temperature remain?

Dr. McKercher:

We do not have accurate information on that. For 24-72 hours it remains at 104°, but is variable part of the time. In some animals, there is considerable difference in temperature response. It was suspected that some animals had pneumonia, but absence of a high white count more or less ruled that out.

Dr. Jensen:

Dr. McKercher, in California, do you encounter field cases without pneumonia?

Dr. McKercher:

Yes, I think we do. In severe outbreaks, animals die very quickly. We assumed at the time that since they showed no clinical symptoms, but died several days later, that death occurs in severe cases without pneumonia.

Dr. Ramsey:

Do animals make complete recoveries?

Dr. McKercher:

Yes, the cases that do not become chronic make rapid recovery in 10 days to 2 weeks. Clinically, they appear normal. When temperature drops, the minority go into a chronic stage. These animals usually died.

Dr. Chow:

I believe they can recover completely, be put back into the feed lot, and marketed. My part of the discussion will include the 2 parts of the work that have been done this year. One part is the epizootilogical study of the field outbreak and the other part is our experimental reproduction of this disease.

In attempting to determine the seasonal incidence of this disease in Colorado feed lots, a particular feed lot which usually has 30-40 thousand cattle on feed yearly was selected for this epizootilogical study. Records of the monthly occurrence of rhinotracheitis for a period of a year were tabulated.

The outbreak started in this particular feed lot in April 1954. In that month, there were 108 cases and in May, 507 cases were observed. The incidence dropped in June, but in July it rose again. Through this part of the season, the incidence continued to mount until October and November, when it gradually declined. A seasonal significance was indicated except for the May and July. The record also indicated that the population of the feed lot did not show any significant relationship to the incidence.

A study of the clinical course of rhinotracheitis in feed lots showed that 1300 out of 2600 recovered animals were sick for a 4-day period. Almost 90 percent of the animals became sick within 20-60 days after entering the feed lots. Feeder cattle coming from 9 western States into the feed lots showed no significant degree of difference of susceptibility to rhinotracheitis. Due to the feed-lot condition, we were unable to discern any particular relationship between this disease and the age, breed, and sex of the animals. Animals weighing between 700-800 pounds when placed in the feed lots gained a hundred pounds or more before contracting rhinotracheitis. Does this indicate that cattle weighing 700-800 pounds are more susceptible than others?

In our experimental transmission trials, we inoculated 15 animals and produced the disease in 9 of them. We sacrificed two of them for pathological study.

Bacterial and hematological studies were conducted with no particular results. In the bacterial study, we could not find any significant change of the bacterial flora before or after the disease. The test animals were inoculated either aerosally and intravenously or aerosally alone. Inocula materials were saliva and febrile sera of sick animals or tracheal exudates and splenic suspension of those animals that died of rhinotracheitis. The inocula was divided into two groups--one, a bacteria-free group, and the other one, the original material with whatever bacterial content there might be. Both groups of inocula produced sickness of the same nature. One thing I should point out is that all the inocula for intravenous inoculation was bacteria-free material. We didn't use filtration to obtain our bacteria-free material because the viscosity of the material was rather high. It is difficult to obtain enough material for inoculation, so our material was made bacteria-free by high speed centrifuge and aerobic and anaerobic culture.

The response of temperature is not as high as we had in the field cases. The body temperatures raised 3-5 days after infection. It seems we have a longer incubation period in experimental reproductions than that of Dr. McKercher's work.

The characteristic clinical signs were mucopurulent exudate and a dry cough. Five to seven days later, the animals returned to normal. These recovered animals were kept for further use.

We are planning an experiment, intended to determine whether the fattening process has any relation to susceptibility of the cattle. All the rhinotracheitis cases came from feedlot cattle and a few dairy cattle. So far, there is no report among ranch cattle. It is our plan to use 40 cattle, putting half of them on a fattening diet and half of them on a maintenance diet. We will then expose all the animals to rhinotracheitis to see whether the two groups will show any difference in susceptibility.

Dr. Van Houweling:

Thank you very much, Dr. Jensen, Dr. Brown, Dr. Chow.

There is an item on our agenda for the appointment of a Resolution Committee. I don't know that we want a whole lot of resolutions, but we certainly do want some recommendations as to what should be done in the way of follow-up on the part of different individuals and organizations following this meeting, and I presume that it is my responsibility as Chairman to name this committee. I would like to ask these people to serve on this committee. They are as follows: Dr. Schneider, Chairman, Dr. Pritchard, Colonel Maurer, Dr. Brown, Dr. Mulhern, Dr. Jensen, Dr. McKercher, Dr. Marsh.

AFTERNOON SESSION

Dr. Van Houweling:

I think several of you in the room have had an opportunity to see some slides that Colonel Maurer has on rinderpest, but there are some who haven't and because it seems to me there is a marked similarity between his slides and those Dr. Ramsey showed this morning, it will be worthwhile to take a few minutes to run through Colonel Maurer's slides. I've asked him to point out some of the differences that he thinks he can detect between some of his slides and those of Dr. Ramsey. Even though we are currently quite confident that the condition is not rinderpest, we are concerned now about the possibility of rinderpest being called mucosal disease for a little while if rinderpest should get in. I think it would be worthwhile to take a few minutes for that purpose.

Colonel Maurer:

As Dr. Van Houweling has said, it is probably worth spending a few minutes on rinderpest because of the very marked similarity between rinderpest and mucosal disease. I do not believe that we have rinderpest in this country. But if it should slip in with these new diseases present, it might get very widely scattered before the difference was detected. I'll try to point out the few places where rinderpest differs. Unfortunately, based on the gross pathology they are more similar than they are different.

The temperature curve is a typical average one in which the temperature rises from normal to over 104° during about a 24-hour period. It goes on up to the peak in about another 48 hours, and then tapers off over a 4- or 5-day period, but stays above normal. It drops sharply just prior to death. Now, we refer to the clinical changes in reference to the positive temperature curve.

During the period of temperature rise, the animals are restless, have a dry muzzle, and clear tears. The clear tears are of some significance because by means of them one can often pick out cattle with positive temperatures. Leukopenia develops very early during the first 24 hours. It continues, becoming increasingly more severe for the duration of the illness and terminally may drop to less than 1000 white cells per cubic millimeter. Nasal and lacrimal discharges occur during the 2nd or 3rd day of temperature. They start out as a mild serous discharge, later become mucopurulent. The lacrimal nasal discharges are never particularly copious. They are not as severe, for example, as one sees in malignant catarrah. There is retarded rumination and anorexia, depression and photophobia. Salivation appears shortly thereafter. The saliva does not appear in long tenacious mucoid strings such as occurs in foot and mouth disease. The animal salivates because it is too depressed to keep its mouth closed, hence drools essentially normal saliva. Oral lesions appear at about the peak of temperature; later they become increasingly severe. With the onset of diarrhea, the temperature tends to drop. Abdominal pain, dehydration and emaciation become increasingly more severe from that time on. Cough may or may not occur, depending upon the amount of respiratory involvement. The dehydration becomes very marked; weakness, prostration and death soon follow.

The very earliest oral lesions that one can detect are the small white pin points of necrotic cells which first appear on the ventral surface of the tongue. There is often a very slight elevation of those dead cells above the mucosal surface.

The histologic explanation of these small white raised areas are foci of necrosis which start in the stratified squamous epithelium just above the basal layer. From that point they progress upward to the surface. This is a point worthy of note because from preliminary study of the lesions of mucosal disease and viral diarrhea, these viruses tend to attack the surface and penetrate downward. Rinderpest lesions are never vesicular in spite of the fact that they start deep in the epithelium. They do not invade the basal layer penetrating the submucosa; hence, they are erosions and not ulcers.

In a well-developed necrotic tongue lesion there has been a progression of the necrotic cells from the depth up to the surface of the buccal mucosa. At this time they appear grossly as light gray slightly raised pin point areas. There is very little in the way of inflammatory response adjacent to these areas of necrosis. There are no white cells nor other inflammatory cells around this area. Grossly, one sees a small eroded edged-out pit with a red raw floor surrounded by essentially normal tissue.

As the lesions advance, whether it be on the tongue or on the mucosa, these small necrotic spots tend to increase in size laterally and coalese to become large one.

In histologic section of the tongue there is a normal zone quite sharply demarcated from the areas of necrosis on either side. The only infiltration of inflammatory cells is on the surface. The basal membranes are still intact, so it must be considered an erosion rather than an ulcer. There is some edema and congestion in the submocosa.

On the lip, as on the tongue, the lesions increase in size, producing distinct areas of erosion. The areas of erosion are usually the first lesions observed because the earlier necrotic foci are so difficult to detect.

The extent of erosion in the mouth will vary with the strain of virus and the susceptibility of the animals. In cases where there is a virulent strain of virus, erosion involving 70 or 80 percent of the oral mucosa may occur with the exception of the dorsal surface of the tongue. In contrast to mucosal disease, we have never seen lesions on the dorsal surface of the anterior seven-eighths of the tongue. In the area where the tongue dips over into the pharynx, one may find lesions but the dorsal surface of the tongue proper does not bear lesions. This observation is based on detailed autopsies on over 400 head of cattle and on roughly 200 additional clinical cases.

Lesions also occur in the roof of the mouth, particularly where the mucous membrane is relatively thin behind the transverse raphae.

Microscopically one does not usually see gross lesions in the reticulum, rumen, and omasum in rinderpest, but occasionally one can find small microscopic zones of necrosis of the mucous membranes. Only very rarely will one see a small grossly visible erosion on the pillar of the rumen or on the edge of the leaves of the omasum, and in nothing like the frequency that they are reported in mucosal disease.

Down to the abomasum, you will recall, the mucosa is covered with stratified squamous epithelium with several layers of cells to protect the underlying vascular bed. Apparently, for that reason, the lesions produce slight vascular response. From the abomasum distally, the mucosal lining of columnar epithelium provides only one layer of protective cells. From the abomasum on, damage to epithelium results in more congestion, extravasation and hemorrhage than seen down to the abomasum. In this portion of the digestive tract, lesions are most frequently found in the pyloric portion of the abomasum, in the ceacum around the iliocecal valve, in the cecocolic junction area and in the terminal colon and rectum.

In a close up of the pyloris of the abomasum there are seen clusters of petechial hemorrhages which later tend to coalese to form diffuse hemorrhages. Histologically, many of these petechia are areas of marked engorgement and stasis of blood in superficial capillaries.

In the fundus one frequently finds small erosions along the edge of the folds of mucosa and occasionally some edema.

In other portions of the abomasum, there are small areas of erosions, some edemic spaces, hemorrhage in the lamina propria and areas of congestion in the submucosa.

In the small intestine, lesions are less frequently found than in the abomasum, cecum, or large intestines. The mucosa may show some congestion, hemorrhage and erosion, but, as was true with mucosal disease, the Peyer's patches are most strikingly involved. Here the lymphocytes have necrosed to the point where the entire Peyer's patch will slough out.

In a cross section of a Peyer's patch with a lymphoid follicle there are clear zones in the follicle which would normally be filled with dark mature lymphocytes. The lymphocytes have become necrotic and have been absorbed. In the germinal center, there is cell debri, some amorphus, eosinophilic material and, very few lymphocytes.

A close up of that same lymphoid follicle shows very few lymphocytes remaining. This is of interest and importance in studying rinderpest because sometimes animals die without showing gross lesions, and occasionally without a positive temperature. It was difficult to know what was killing such animals. The very drastic leukopenia and almost complete destruction of lymphocytes provides an explanation.

The lymphocytes in the lymph nodes are attacked by the rinderpest virus in the same manner as in the Peyer's patches. They become necrotic and disappear.

A close up of such a node shows the marked absence of lymphocytes in the area. Some edema is evident with very little in the way of inflammatory response. Essentially, a non-inflammatory necrosis of lymphocytes.

The cecum may go through the same sequence of change as in the small intestine. There may be some engorgement and hemorrhage. Erosions may develop.

In the cecum of an animal which had its acute phase a week or 10 days previous to autopsy there were areas of hemorrhage and congestion of blood vessels along the crest of the longitudinal folds which have passed the acute phase and have become dark. Because of that, they have taken on this characteristic streaked appearance. This is the way they will appear for a time in recovered cases.

The cecocolic junction contains a large amount of lymphoid tissue. The folds of mucosa in the cecocolic junction are very heavy as compared with those in the cecum or colon. Since rinderpest virus has an affinity for both lymphocytes and digestive tract epithelium, it is not surprising that this zone is most congested and hemorrhagic.

The same destruction of lymphocytes occurs in the spleen as in the Peyer's patches and lymph nodes.

The pulmonary involvement in rinderpest is purely secondary. If an infected animal dies quickly, in a matter of 5 or 6 days, the lungs will usually appear normal. It is only in those cases where the animal remains ill for

10 to 15 days that secondary pulmonary involvement occurs. When it does, it's characterized by interlobular and alveolar emphysema, particularly in the ventral areas of the lobes.

In the heart, as well as in the lungs, the changes are secondary. If an animal dies quickly, the heart usually remains normal. If the case is prolonged, especially if there is pulmonary involvement, subendocardial hemorrhages in the left ventricle are likely to occur. They tend to occur most severely on the papillary muscles.

Some of the hemorrhage is in the myocardium. There does not appear to be any histologic change in the myocardium that can be associated directly with the disease.

The liver appears to be only secondarily involved, and in most cases remains normal. About all that is found on section of the liver is passive congestion which is associated with pulmonary and cardiac changes. The gallbladder is almost invariably enlarged in rinderpest.

The mucosa of the gallbladder appears to go through the same sequence of change; congestion, hemorrhage and erosion as can occur in the intestinal tract.

Since our time is short, this will be all unless there are some questions.

Dr. Van Houweling:

Does anyone have any questions to direct to Colonel Maurer? If not, let's proceed with some of these discussions from others who have had experience with one or more of these disease conditions, who would like to make some comment.

Dr. Davis:

In 1950 when clinical rhinotracheitis was first observed by Dr. Jensen in feedlot cattle in northeastern Colorado, cases with lesions of a similar character, but perhaps of a milder degree, were encountered at postmortem examination of feedlot cattle coming to slaughter at the Denver Station. Affected animals appeared normal on antemortem inspection and there were no clinical signs to arouse any suspicion that they were affected with an upper respiratory condition. Since lesions of this nature had not been previously observed by the veterinary inspectors, we were called in consultation.

The lesions were confined to the upper respiratory tract and in most instances consisted of petechial hemorrhages in the mucous membranes of the turbinates, nares, larynx and trachea. In a few instances a non-adherent, sero-fibrinous or pseudo-diphtheritic exudate was found on the mucous membranes in these areas. This exudate could be easily removed with forceps, leaving an intact underlying mucosa. The postpharyngeal lymph nodes invariably showed a more or less degree of edema and congestion. These

abnormal lymph nodes were an indication to the inspector to make further examination for lesions of rhinotracheitis. The oral cavity was free of lesions as were the lungs in the cases we were called to examine. Occasionally a few scattered petechial hemorrhages were seen on the epicardial surface of the heart. No petechiae were found in the kidneys. The other visceral organs appeared normal. The number of animals showing lesions in several lots examined varied from 10 to 60 percent.

Subsequent to 1950 and continuing up to the present time, this condition has been periodically observed in slaughtered feedlot cattle. For want of a better name, we at first considered the condition to be an early phase of the so-called shipping fever syndrome.

Of particular interest at this point is the postmortem findings in a lot of 32 yearling calves from a Wyoming ranch that were shipped to Denver for slaughter as suspected cases of mucosal disease. Sixty percent of these animals showed lesions of rhinotracheitis but no evidence of mucosal disease was found as reported by Dr. Wayne Anderson of our laboratory who assisted in the postmortem examination. Dr. Ryff and Dr. Breen of the Wyoming State Diagnostic Laboratory at Laramie have made some additional observations in this particular lot of calves prior to slaughter that will no doubt be of some interest to this group and will be discussed later.

It should be mentioned here that the inflammatory exudate on the laryngeal mucosa in rhinotracheitis should not be confused with the lesions of necrophorus laryngitis (calf diphtheria) that is commonly seen in Colorado feedlot animals. The latter condition is characterized by a necrotic, foul-smelling, often deep-seated parboiled appearing lesion involving the tissue about the laryngeal orifice. In contrast, the inflammatory exudate on the larynx in rhinotracheitis is more often diffuse and superficial and this can be seen in histologic sections as well where the submucosal tissue is relatively free of inflammatory cells. In the areas of superficial necrosis and in the sero-fibrinous exudate there are usually seen several different kinds of bacterial forms, both gram-positive and gram-negative, including some beaded, filamentous gram-negative bacilli morphologically resembling necrophorus organisms. Dr. Jensen's belief that a necrophorus lesion can develop in the larynx of some cases of rhinotracheitis is well taken.

My reason for illustrating and discussing the lesions in slaughtered animals is to get an expression of opinion from either Dr. Jensen or Dr. McKercher as to whether such cases are early or recovering cases of rhinotracheitis.

Dr. Van Houweling:

Dr. Jensen, do you want to give an opinion or Dr. McKercher?

Dr. Jensen:

We have sacrificed a few field cases which were presumably in the early stages and found lesions that resembled those; so, my opinion would be that these are early lesions, not exceeding a week's duration.

May I comment just a little on calf diphtheria? At Fort Collins, it is our interpretation that calf diphtheria is an infection which is secondary to something else, and perhaps one of the primary causes to which calf diphtheria becomes secondary is rhinotracheitis.

Dr. Van Houweling:

Dr. McKercher, do you want to add anything?

Dr. McKercher:

No, I have no comment other than to point out that I agree with Dr. Jensen in that these must be early cases.

Dr. Davis:

That was my main reason for showing the pictures to these men doing research on this disease. If you're concerned with getting nasal washings from early cases for transmission trials or experimental studies, you can go out to the packing house here in Denver most any day and get material. This information may be of some value to you research men. You may find the same thing in your packing houses in California.

Dr. Van Houweling:

Does anyone else have any comment on Dr. Davis' presentation? Who else has something to contribute at this point in the agenda? Are you going to discuss the recent Wyoming case, Dr. Ryff?

Dr. Ryff:

We have some mucosal disease in the northeastern part of Wyoming. We've had about a half a dozen herds but it has not been a problem there. They've had 1 to 4 animals in each herd, and it seems to be confined to that. Some diagnoses were based on symptoms and some were based on animals brought to our laboratory. Within the past 3 months, we have had another outbreak of mucosal disease in the southeastern part of the state. This man had approximately 70 calves and, in this period of 3 months, he lost, according to his tally, 26 of these, or something similar to that, all of them showing symptoms of what we felt was mucosal disease. We had 8 of the animals at our laboratory and they varied in degree, but all of them showed lesions that we felt were very compatible with Dr. Ramsey's description. We opened the nasal passages of several animals, and in 2, especially, we did have some congestion, but that was as far as it went in the nasal passages itself. The owner was a very conscientous person and he disliked to sell these animals or dispose of them for stock; it looked as if he were going to lose all of them, so he made arrangements to have them slaughtered, and they were sent down to Denver. At that point, Dr. Davis entered the picture when he was called to the killing floor. Postmortem examination revealed that 60 percent of the survivors of the 70 calves showed the early lesions of rhinotracheitis. Whether there is a connection between the two diseases due to this, or whether they simply picked up the rhinotracheitis, which apparently has a short incubation period, part of it while going to Denver, I couldn't say.

Dr. Breen:

In this case, at Burns in southeast Wyoming, the first thing that the owner noticed (you've got to give these men a lot of credit—they can spot sick animals a lot quicker than a lot of veterinarians) was this profuse watery diarrhea. Animals that we saw with this symptom when we visited this ranch for any reason, would be dead within a few weeks. Practitioners from the Cheyenne area have been out there on two cases. When they were called out, it was because of this severe watery diarrhea, and in both cases there were prolapsed rectums. The practitioners reduced them surgically. One case was thought to be coccidiosis, but the diarrhea continued despite treatment and the animal died. The other practitioner told the owner "I have no idea what is causing this watery diarrhea". Again, we want to point out the clinical picture—when the owner notices the animal having a very severe diarrhea.

We ran some of these animals around the corral trying to load them up on the truck to take to our laboratory, and at no time did we pick up any kind of respiratory involvement. They would run a temperature for a week after dehydration and, on postmortem, the only lesions we found involving the respiratory system were, as Dr. Ryff mentioned, in the nasal cavity, showing hyperemia and edema. The lungs were good; the trachea was clear; and those were the only things about which we're quite concerned. A very clear cut picture of mucosal disease and the very specific lesions picked up on postmortem examination looked like the pathological lesions that conformed with what Dr. Ramsey was describing. Then, the clinical picture of rhinotracheitis was first observed on postmorten examination at the time of slaughter.

Dr. Davis:

This indicates to us, at least, that we had both rhinotracheitis and mucosal disease existing in the same herd at the same time. Just how long rhinotracheitis was present in this herd, Dr. Breen, you can judge from what these gentlemen have said—that early cases might be difficult to detect. We have this other complicating factor; they may have had rhinotracheitis for some time before they came down for slaughter—we don't know and neither do you, of course, because you didn't suspect rhinotracheitis. The cases that you saw were all mucosal disease, apparently, and because of the gross difficulty in picking up early cases of rhinotracheitis even by the experienced practitioner, this disease may have existed for some period of time before the animals were sent to slaughter. That's the way we look at it, I don't know whether we're right or not.

Dr. Van Houweling:

Dr. Beamer, what do you have to report from Illinois?

Dr. Beamer:

We reported at Purdue that we have seen some 9 or 10 cases of a condition which we regarded as identical with mucosal disease as described by Dr. Ramsey, these cases having occurred last year. This spring we have seen probably a half dozen cases, being both grossly and microscopically

substantially the same as Dr. Ramsey has shown us. Also, this spring, we have had 3 outbreaks in feedlot cattle with respiratory distress and respiratory pathology very similar to that which Dr. Jensen and Dr. Chow have described. The epidemiology of these outbreaks was also very much the same. I would like to say that the lesions at autopsy were probably not as severe as those which have occurred in Colorado, but the difference was one of quantity and not quality. In talking to practitioners about the State of Illinois, I believe this condition is occurring with some greater degree of frequency. We have had no reports about dairy cattle. It has all been in feedlot cattle. Most of our feedlot animals are imported.

Dr. Van Houweling:

I remember at the 1954 state meeting, Paul, that there was a paper on mucosal disease presented by a practitioner from pretty well down in the state. At least, that is what they called it on the program. I didn't hear it. Was that case of the nature that Dr. Ramsey described?

Dr. Beamer:

Yes.

Dr. Van Houweling:

Dr. Schneider, my eye falls on you next. We haven't heard anything from Idaho.

Dr. Schneider:

I can only briefly say that about 2 years ago we had our first outbreak of this upper respiratory infection. That was a case around Twin Falls where 800 head of feedlot cattle were infected out of some 4000 that were in the lot. The specimens that were submitted to the laboratory were only from one animal, and they were identical to the pictures that we have had today about the respiratory disease. Since that time, other samples and material from that area have been forwarded to Fort Collins to Dr. Jensen. He, too, feels that it is the same or a similar condition. We have had several other types of conditions seen throughout the state, but they occurred in individual animals and the animals didn't die. However, we've seen just recently--last week—two cases where we feel it is the upper respiratory disease. We possibly have had some of the other types of infection also, but not too severe, and it has been reported by the practitioners of the Twin Falls area as upper respiratory disease in dairy cattle.

Dr. Van Houweling:

In dairy cattle! That leaves Montana, I believe, Dr. Marsh?

Dr. Marsh:

As I said this morning, starting about 10 years ago, we had several outbreaks

of a condition which I believe corresponds to the mucosal disease described by Dr. Ramsey. We also had foot lesions, quite consistently. There were several peculiar things about that condition. We had diarrhea, characteristically, and yet some of those cattle had just the opposite. I suppose it's the stage of the infection. We had relatively high temperature early in the course of the disease, and in one herd that I followed through pretty closely for 2 years and did a lot of work with some of the animals, we had a little pneumonia going along with it pretty regularly—not in every case, but a slight coughing was rather characteristic. These cattle were mostly calves and yearlings, and they were not feedlot cattle—they were so-called "semi-range" cattle. The peculiar thing about one herd was: they were owned by a farmer who had a little bunch of about 100 cattle on pasture and in one season he lost about 20 of his calves. I think, if I remember correctly, there were 50 odd calves and he lost about 20 of them in one summer. His cattle ran in a pasture and his brother's cattle—another little bunch—ran on the other side of this big pasture. All the cattle came to the same water hole to water, but they were quite cliquy in their habits, and each bunch of cattle went back from the water hole to his own side of the pasture. Of course, they had some mixture, but all the cases were in one herd. I never was able to figure that out, since, if this was a contact infectious disease, it certainly should have appeared in both herds.

We recently had two outbreaks reported that I think correspond to the mucosal disease described by Dr. Ramsey, but of a little different type. They corresponded more closely with the description that Dr. Ramsey gave. In both cases, there was a lesion which interested me. Possibly it's common, but I've never noticed it before. There was a very sharply circumscribed necrotic lesion distributed all the way along the mucosa of the esophagus—oval-shaped lesions about 1-2 cm. long. There was necrosis of the epithelium on the surface, but no ulceration. Speaking of necrophorus, when we examined these lesions we found Spherophorus necrophorus in the lesions, to which we didn't attach any significance except that the epithelial erosion had created a condition which is favorable to the attack by necrophorus. We also think we've had a few cases of rhinotracheitis, but is is not a problem that we know of, as yet.

Dr. Van Houweling:

Thank you, Dr. Marsh. Dr. George, do you want to speak for Nebraska?

Dr. George:

We've had several scattered cases of the so-called mucosal disease with varying degress of morbidity and mortality. As far as the so-called rhinotracheitis, I assume that it's probably in the state, but to my knowledge, it has not yet become a problem.

Dr. Van Houweling:

Does anyone have anything else to contribute to the general discussion? Dr. Miller, we haven't heard from you. Would you have any comment?

Dr. Miller:

No, I don' think I have anything to add in any significant terms. As for rhinotracheitis, it sometimes exists, I think, in range cattle without being noticed. In other words, if the practitioner was called upon to investigate the death of an animal, we'd probably find that there was 1 or 2 or more, maybe 10 or 12 in a bunch, that were sick and some of them in the terminal stages. In other words, if the disease slips upon the caretaker or the owner or whoever is in charge, as the sick animals mingle with the others, it's rather hard to recognize. In this instance of the cattle from Wyoming, it's very possible that the rhinitis existed without being recognized until they came out on the killing floor. But we know, as practitioners, that the condition will exist to the stage of fatal termination before it is recognized. It spreads so rapidly that it gets to that stage before it is noticed when the animals are in a large group.

Dr. Van Houweling:

I think I heard when I was around here a couple of weeks ago, that an occasional death may be actually due to asphyxiation. Have you folks seen that in Colorado?

Dr. Miller:

It is known that the exudate in the trachea or the bronchi is so severe that it diminishes the lumen and plugs up the bronchioles.

Dr. Brown:

We run across a case every once in a while where there is asphyxiation. I would like to question Dr. McKercher as to whether he did get Brahma or cross-bred Brahmas in the feed lots in California or was the disease only in the English breed?

Dr. McKercher:

I've never known of this occurring in the Brahma in California. In the feed lots we've investigated, we didn't have any Brahmas. As a matter of fact, I don't believe I've seen any Brahmas in California, although we have them. But to my knowledge, they've had no trouble with the Brahma animal, at least, we've never heard of any.

Dr. Jensen:

This morning, Dr. McKercher indicated that some cases were designated as chronic in nature. The question is, what lesions do you find in these chronic cases?

Dr. McKercher:

Actually, we haven't made a study in pathology as many of you have, as a matter of record. However, we've got the type of animal that dies, as I mentioned earlier, particularly in an acute outbreak, probably during the febrile stage. We've made a few posts on such animals and we have never found any lung involvement. There is a severe congestion of the upper respiratory tract and the trachea and there will be some sero-fibrinous exudate. Then there are other cases that become chronic and which undoubtedly die of pneumonia. In those cases of course, we do find a considerable amount of lung involvement as well as hemorrhage, and this cheesy exudate in the upper respiratory tract and in the trachea. That is the only differentiation that I make.

Dr. Van Houweling:

At the conclusion of, or somewhere during the meeting on mucosal disease at Purdue last February, there was a committee appointed to make some recommendations as to what should be done and we've asked Dr. Pritchard, who was named chairman of that committee, to review with us some of the recommendations and conclusions that came from that meeting.

Dr. Pritchard:

I'm not going to talk very long about the Purdue Conference. That meeting is over and I guess we can't change anything that happened there, so I'll briefly tell you what happened, and then I'll try to make copies of the minutes* of that meeting available for some of the people who might want them.

Dr. Simms first suggested that we have a conference on mucosal diseases because he was quite concerned about the numerous reports that he had received about these diseases appearing in various parts of the country. He recognized the potential danger of all of these diseases and thought a conference might help. I think, if we look a little into the back-ground that prompted him to arrive at that conclusion, we can see how serious the situation looked at that time. If you remember, it was in 1946 that Olafson first reported on virus diarrhea—that's about 10 years ago. That same year, in 1946, Childs in Canada, reported on a very similar disease. He called it X-disease of Saskatchewan. It was very

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*Copies of Minutes mailed to people requesting them August 1, 1955.

similar to virus diarrhea. Shortly after that, the Swedes reported on their epizootic enteritis, which again is very similar to both Childs' disease and to Olafson's virus diarrhea. In 1953, Dr. Ramsey and Dr. Chivers reported on mucosal disease which had, even by 1953, been recognized in many parts of the country. In 1954, the virus diarrhea problem in Indiana became apparent. At about the same time, the problem in California and the problem here in Colorado became apparent. You can see that within a period of ten years--less than 10 years--there were a number of very important diseases that were at least newly recognized, and Dr. Simms felt that it was time some correlated effort be made to start research on these problems and try to learn more about them while we could. In addition to this, of course, as Col. Maurer has pointed out, many of these diseases are so similar to rinderpest that we really couldn't afford to take too many chances about waiting to do research on the problem because of the possibility that rinderpest might be introduced into the country. That is the background for the Purdue Mucosal Disease Conference.

The purpose of that conference, as Dr. Mott summarized at the conference, was as follows: (1) to summarize the available information on all of these diseases; (2) to bring research workers together so that they could exchange information freely and, perhaps, to make plans for exchange in the future; (3) to correlate the research so that progress could be much more rapid and perhaps more efficient in the research on the problem.

It seemed to us at that time that the main problem was one of identification. We had a problem, several problems, in Indiana. We weren't sure if they were the same as the ones Dr. Ramsey had or somebody else had. At least, our major problem was one of identification. Which reminds me of the poor sheriff down in southern Indiana--back in the middle 30's. It seems as though the Chicago hoodlums were getting out of the city and going down to Indianapolis and had robbed a bank. One of them was shot and the other one escaped to southern Indiana. The State Chief of Police knew who the one was that had escaped. He sent pictures of him down to the sheriffs in the entire southern part of the State. He sent pictures of his profile from the left and the right, the front and the back. In fact, he sent 4 pictures altogether. About 3 days later, the State Chief of Police got a phone call from the Sheriff in Spencer County. He said, "Say, I've got three of those fellows locked up and I think I'll arrest the other one this afternoon." That's about where we were. We thought we had everything; actually, we didn't know what we had and needed some help in identification. At the conference, a number of diseases were discussed. Dr. McEntee and Dr. York discussed the virus diarrhea problem; Dr. Ramsey discussed mucosal disease; Dr. Hoyt, the bovine malignant catarrh; Dr. McNutt discussed sporadic bovine encephalitis; Col. Maurer, rinderpest; Dr. McKercher, the influenza-like disease or upper respiratory disease; Dr. Deem, rhinotracheitis; and Dr. McKercher also discussed bluetongue. Dr. Carlson and I discussed the Indiana problem. We had short summaries made of these and they will be available to those of you who want them. A committee was appointed at the conference to make recommendations during the time of the conference, and Dr. Ramsey was chairman of that committee. We regret that Dr. Ramsey had so much work to do that he couldn't carry on as Chairman of the Working Committee, but he was chairman of the

original committee. I'm going to read these recommendations--they might be of interest to you--then I'll try to indicate just what has been done so far to carry out these recommendations:

1. Have recovered cattle from known outbreaks of these diseases been challenged with known virulent rinderpest virus by the Department of Agriculture.

The conference felt that it was important to determine if these diseases were related to rinderpest, and that this would be the quickest way and perhaps one of the surest ways in the long run to get accurate information on the relationship of these diseases. We haven't been able to quite carry out this project--we've had animals available, but I understand they've been flooded at Grosse Isle, so they haven't been able to do the work yet.

2. Studies to be initiated to establish the relationship of these diseases to each other by means of cross-protection and serologic tests.

We know there are clinical differences between these diseases, some clinical differences, at least. We know there are certain pathological differences, but the conference felt that there was a very urgent need for definite serologic and other tests that could be used to help differentiate these diseases from the research as well as from the practical point of view. Some of these have been conducted since the conference and they will be discussed shortly.

3. Studies of the diseases and of the etiologic agents should be continued and expanded.

Certainly those of us who were at both meetings realize how much work has been done since last February. The progress made in the California laboratories and the Colorado laboratories indicates that really tremendous strides have been made in this point number 3.

4. Additional funds should be made available so that the above project can be implemented in the near future.

We haven't done too well in that regard.

5. Additional conferences should be held by workers with these diseases to exchange information and coordinate plans for research.

Well, we're here today doing that very thing.

Now, I'll say a few words about this chart that we have over here on the blackboard. It is so small that I'm sure many of you can't see it. Before we leave this meeting today, we will get together the people that have been

working on these diseases and go over each of these points and bring them up to date so that they can be included in the minutes and each of you can make comparisons. This chart will be a summary of the information that we have to date.

Dr. Van Houweling:

I raise the question whether you might not just want to meet as a small group at the conclusion and do that all at once. Can you do it that way?

Dr. Pritchard:

Sure. We could use your little library very well for that, couldn't we, Dr. Davis?

Dr. Van Houweling:

He wants you all to go see it anyway, and so, if each group would pick out their representative and meet with Dr. Pritchard at the conclusion of this conference, I presume that would be the quickest way to do it.

Thank you very much, Dr. Pritchard, for your very fine discussion.

The next item on the agenda is the report of the examinations conducted at Grosse Isle on selected specimens from representative states. We hoped that Dr. Mott would be here to discuss this—he's very closely connected with it—but I understand he's arranged with Dr. Davis to represent him and has given him some of the information that they had and Dr. Davis is prepared to discuss this item.

Dr. Davis:

Dr. Mott called yesterday that he'd be unable to attend this meeting. Briefly, he told me that frozen spleens and anti-sera from recovered cases of Purdue viral diarrhea, mucosal disease in Iowa and Illinois, and rhinotracheitis in California and Colorado were all tested for evidence of rinderpest with negative results, as far as they were able to go.

Excerpt of a letter from Dr. Chas. A. Mitchell, Canadian Department of Agriculture to Dr. B. T. Simms, dated June 20, 1955:

> "This serological work taken in the light of our experience indicates clearly that whatever the nature of the inciting cause of mucosal disease, it is not related to rinderpest virus."

Dr. Van Houweling:

Is there any question in regard to that report? Apparently not. I have to apologize for one thing; Dr. York has been leaning back so he was

WORKING COMMITTEE REPORT

STATIONS CONDUCTING RESEARCH ON THE MUCOSAL DISEASES

Station	Working	Disease	Type of Research	Facilities
Wisconsin	Yes	CPE[2], WD	A, E	Yes
Colorado	"	RT	A, E, H, P, T	"
Kansas	"	VD-Ind.	A, P	"
North Dakota	"	MD	A, H, T	"
Nebraska	"	MD	A	"
Ohio	"	MD, VD	P	No
California	"	RT, VD	T, A	Yes
New York	"	VD, WD	E, T, A	
Alabama	"	MD	P, T	Yes
Missouri State C.	"	BMC	P, T	"
Illinois	"	MD, RT	T	"
Virginia	"	VD	T, A, P	"
University of Pa.	"	WD	T	"
South Dakota	"	MD	E, P, T. A	Not Adequate
Washington State	"	MD	A, P	" "
Minnesota	"	WD, MD	E, A, P	" "
Indiana	"	MD, VD-Ind.	A, T, P, E, H	Yes
Iowa	"	MD	A, T, P, E, H	"

Legend:

A - Work on the agent
E - Epizootiology
H - Hematology
P - Pathology
T - Transmission

BMC - Bovine malignant catarrh
CPE - Calf pneumonia enteritis
MD - Mucosal disease
RT - Rhino-tracheitis
VD - Virus diarrhea
VD-Ind. - Virus diarrhea-Indiana
WD - Winter dysentery

hidden behind Dr. Deem and in my rouse around the room, I was going by states and I didn't think of you. I should have given you an opportunity to report any observations you had to make on these conditions, anywhere—we won't limit you to a state.

Dr. York:

I don't think there is anything at all I can add to what has already been said up to this time.

Dr. Van Houweling:

Are there any questions about the tests that were run at Grosse Isle?

I might say that all the livestock sanitary officials and our federal veterinarians in charge received a notice from Dr. Simms some weeks ago in regard to this inquiry, indicating that the test up there had been made as far as rinderpest was concerned. I'm also under the impression that Dr. Mitchell has indicated a willingness to do some more work with us on this problem if it is deemed necessary. I don't know just when he can do it, but I believe he is willing to continue. I might say, too, that the BAI had this arrangement with Dr. Mitchell for several years—that he would be willing to check some of these suspect disease conditions down here against some of the necrotic diseases that he is able to work with on Grosse Isle.

If there is nothing further in that regard, we will move on to the next item on the agenda and I guess it again falls to Dr. Pritchard's lot to make a report as to some of the activities of the working committee appointed at Purdue since that meeting.

Dr. Pritchard:

The Working Committee on mucosal diseases consisted of Dr. Beamer, Dr. Maurer, Dr. McEntee, Dr. McKercher, Dr. Mott, Dr. York and myself. The committee has done several things and I believe I said to you, I will just go through them one by one and explain the reason why some of the actions were taken and some of the things that may have been gained by them. The first thing the Working Committee did was to draw up a project outline on mucosal diseases. We drew up an outline based on the procedures that the Regional Committee used, and we did that for several reasons. One was that we were trying, or had hoped to try, to have mucosal diseases become a regional project in one or more of the regions. So we drew up a model project outline to serve as a basis in case we could establish this type of research as regional programs. In addition, we thought it would be a very good way to project the problems that needed to be solved with these diseases in a way that they could be used by the various stations. That project outline is included in the minutes in case any of you wish to look at it or wish to use it. Some of the objectives have already been obtained and we will try to get into those in a little more detail a bit later.

The second thing the committee did was to draw up some recommendations for uniform procedures for conducting serum neutralization and cross-protection tests on the mucosal diseases of cattle. Those recommendations are included here, in case anyone would want to use the procedures that most of our laboratories are using for these cross-protection and serological tests.

PROJECT OUTLINE FOR COOPERATIVE RESEARCH ON THE MUCOSAL DISEASES OF CATTLE

Title:

Mucosal Diseases of Cattle.

Justification:

Since 1946 a number of diseases of cattle with many similar clinical and pathological manifestations have been reported from various parts of the United States. In general they are characterized by a febrile reaction, respiratory signs, ulcers and erosions of the oral and intestinal mucosa and diarrhea. The diseases in this group have been named virus diarrhea (New York), mucosal disease (Iowa), virus diarrhea (Indiana), necrotic rhinitis and tracheitis (Colorado), and influenza-like disease (California).

One or more of these diseases have been observed in 20-24 states. The reported incidence has varied from sporadic appearances to outbreaks of epidemic proportions. The reported mortality has varied from 0-50 percent. Probably the most serious aspect of this disease is the economic loss, resulting from the marked loss of body weight and condition that occurs in non-fatal cases. The total economic losses sustained as a result of deaths from these diseases has undoubtedly been very great for the country as a whole.

Although it is imperative that the causative agent be isolated for each disease, it is also important to determine if the etiologic factors are the same because of the similarity of these conditions. This can best be accomplished by a cooperative approach for these reasons: (1) The problem is exceedingly complex and requires the application of many different fields of investigation, i.e., immunology, virology, pathology, physical chemistry, etc; (2) Since all of these diseases as described have not occurred in all areas of the country, adequate observations cannot be made by any one laboratory; (3) The immensity of the problem at present physically precludes any one laboratory from satisfactorily making the necessary comparisons of the various diseases in this group.

Only with a proper understanding of the etiological agents and the pathogenesis of these diseases can adequate means of diagnosis, prophylaxis, and control be developed to prevent the losses presently occurring. In addition, because of the constant threat of the introduction into this country of exotic diseases of a similar nature, such as rinderpest, it is doubly important that these diseases be thoroughly studied. Unless

adequate means of differentiation between rinderpest and these indigenous diseases are established, the confusion that now exists might permit such an exotic disease to gain a foothold in this country before it is recognized, with disastrous results to our entire cattle industry.

Objectives:

1. To describe or classify each of these diseases by their clinical manifestations and pathological changes.

2. To determine the etiological agent for each of these diseases and possible relationships between them.

3. To determine by standard epidemiologic means the geographic distribution, incidence and importance of these diseases in the cattle population.

4. To develop adequate means of prevention and control of these diseases.

Procedure:

1. Sufficient numbers of natural and experimentally induced instances of each of these diseases should be subjected to critical clinical and clinical pathological examinations. Complete gross and histologic pathological studies should be made on natural and experimental cases during the course and at the terminal stages of the disease. This will be necessary before adequate comparisons can be made between these various similar diseases.

2. The first step in this procedure must be to determine by proper means whether the disease is transmissible. If the causative agents are infectious in nature, adequate comparisons as to their relationships should be determined by acceptable standard procedures. These procedures would include cross-protection tests, serum neutralization tests and other serological procedures. Studies of the physical and chemical properties of the agent should be included.

3. After the etiologic agents have been determined and serological techniques have been developed, valid surveys can be instituted to determine the extent and incidence of the various diseases in this group. This will permit a critical evaluation as to the economic importance of these conditions.

4. With an understanding of the causative factors, adequate control measures may be developed by the proper use of specific vaccines or other biological or pharmaceutical preparations.

Previous work and Present Status:

In 1946 Olafson, MacCallum and Fox[1] reported on the occurrence of an apparently new transmissible disease characterized by fever, ulcers and erosions of the digestive tract and diarrhea among cattle in New York State.

	Mucosal Diseases				Respiratory Disease
ref.	1 RINDERPEST	2 MUCOSAL DISEASE	3 INDIANA V. D.	4 NEW YORK V. D.	5 RHINOTRACHEITIS
Incubation exp.	3-5	2-8 days	2-5 days	3-7 days	3-5 days
Temperature	above 104	2-3 days above 104	above 104	above 104	105-108
Leucopenia	severe	yes	yes	yes	no
Rhinitis	yes	occasionally	yes	yes	yes
Trachea Inflammation	no,localized hem.	no	yes	no	yes, severe, exudate
Erosions	yes,anteriod 1/3	no	no	no	no
Lacrimation	yes	inconstant	no	no	inconstant
Corneal opacity	no	yes, 10%	rare, calves	no	no
Diarrhea	yes	yes	yes	yes	occasionally
Buccal erosions	yes	yes	yes	yes	no
Erosions on dorsum tongue	no	yes	no	no	no
Infl hem erosion digestive tract	yes	yes	yes	yes	no
Lymphoid tissue damage	yes,severe	yes	yes, mild	yes ?	edema, hem
Lameness	no	yes, 10%	yes, 10%	no	no
Morbidity, herd	100%	2-50%	80-100%	33-88%	to 100%
Mortality, case	90-100% U.S.	90%	0-5%	4-50	3%
Transmissible agent	yes	yes	yes	yes	yes
Agent isolated	yes	no	yes	yes	yes
Immune animals	yes	yes	4 months	yes	yes
Immune serum	yes	?	?	?	?
Neutraliz.antibody	yes	?	?	?	?

General Committee on Mucosal & Resp. Diseases of Cattle:

P. D. Beamer — D. G. McKercher
R. Jensen — L. Mott
H. March — F. J. Mulhern
F. D. Maurer — A. P. Schneider
K. McEntee — C. J. York
W. R. Pritchard, Chairman

References:

1. F.D.Maurer,T.C.Jones, et al,AFIP, Wash.D.C.
2. F.K.Ramsey,Iowa, W.R.Pritchard, Purdue
3. W.R.Pritchard, Purdue
4. C.J.York, P.M. Ind: K.McEntee, Cornell
5. R.Jensen, T.L.Chow, Colo. A & M
D. G. McKercher, Calif.

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After additional studies Olafson and Rickard[2] named this condition virus diarrhea of cattle. Animals that had recovered from this disease were challenged with rinderpest virus by Walker and Olafson[3]. They demonstrated that infection with virus diarrhea did not immunize against rinderpest. The presence of this disease has since been confirmed by means of cross-protection tests in Maine[4] and California[5]. Shortly after the initial appearance of virus diarrhea in New York, Childs[6] (1946) and Hedstrom and Isakson[7] (1951) reported on occurrences of the same or of a very similar disease among cattle in Saskatchewan, Canada, and in Sweden, respectively. No serologic comparisons were made with virus diarrhea (New York).

Ramsey and Chivers[8] (1953) described a somewhat similar disease of cattle which first was recognized in Iowa in 1951. The condition was named mucosal disease because the pathologic findings consisted almost entirely of erosions of the lamina epithelium and mucosa of the digestive tract[9]. The causative agent was not demonstrated.

McKercher, Moulton and Jasper[10], and Schroeder and Moys[11] have reported on the occurrence of an acute upper respiratory infection in California cattle. McIntyre[12] has reported on the successful transmission of this condition.

Pritchard, Taylor, Moses and Doyle[13] (1954) have encountered a disease affecting the respiratory and digestive system which is very similar to virus diarrhea (New York) in Indiana cattle. They have succeeded in reproducing the disease with bacteria free-filtrates of blood. A limited number of cross-protection tests conducted with virus diarrhea (New York) have indicated that animals recovered from virus diarrhea were susceptible to the Indiana disease and vice versa.

Deem[14] (1955) has encountered numerous instances of a disease similar to the others in this group in Colorado cattle. Preliminary studies indicate that it is transmissible.

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Cooperating Agencies:

State Agricultural Experiment Stations, Industries and Agencies concerned.

Dr. Pritchard:

The next thing the committee did was to send out a questionnaire to the research groups in the country and the results of the questionnaire are being put on the board. We were amazed at the amount of research being conducted in this country on mucosal diseases and I'm sure you will be interested too in seeing where the work is being done on these various problems. We'll leave that on the board so if you want to check with some of these other stations that are working on problems that you're interested in, you'll be able to get it there.

We had a lot of other small duties. We thought that our main objective was to help to get funds for the various research groups conducting work on mucosal diseases. As I said earlier, we haven't produced too much to date, but we hope, with the help of Dr. Van Houweling and several others, we will be more successful in the future. We have written up information sheets for the Office of Experiment Stations to use with Congress and so forth, trying to present the case for mucosal diseases and mucosal disease research in this country. We hope, sincerely hope, it will yield some results in obtaining research funds.

The rest of the material can be covered under the heading "New Findings." The Mucosal Disease Committee will report to this group, a few of the new findings that have not been covered so far at this meeting. Each of us will cover a small phase of work that has transpired since the time of the Purdue meeting that has not been covered to date. Col. Maurer, will you start the discussion?

Col. Maurer:

I'm sure we are all gratified to learn how much has been accomplished on these diseases since the Purdue meeting. We, at the Armed Forces Institute of Pathology, would be glad to help out on the pathology of these diseases. In order to be most helpful, we need to obtain tissues from a few well documented cases of each disease upon which virus studies have also been made. We have received some tissues of mucosal disease from Dr. Pritchard and would like to obtain similiar cases from other research workers. By studying such identified materials, we can help establish a base line of pathologic features for each disease which will be helpful for diagnosis. We are not, however, in a position to receive diagnostic unknowns from practitioners.

Dr. Van Houweling:

Dr. York.

Dr. York:

I don't have too much to report. Dr. Pritchard discussed the ways and means of comparing the various agents in different parts of the country and possible relationships between them. At the present time, it is possible by animal inoculation to obtain the preliminary data as to the relationship. However, to make a wide survey, we must get away from the serological view. The past two months, we have been developing the tissue culture procedures for bovine tissues. This technique has been successful for other virus diseases and may be of great assistance in this problem as well.

Dr. Van Houweling:

Dr. McKercher, do you have anything in addition to say?

Dr. McKercher:

I have nothing to add.

Dr. Van Houweling:

Dr. Ramsey, do you have anything?

Dr. Ramsey:

Our main problem has been to study in detail, which we are doing, the gross microscopic aspects of this disease, but I'll say right now that the task of studying some 5000 slides, which should be completed, as far as my thesis work is concerned, by the end of the term, is quite a job. I would like to make one correction. We did send in frozen spleen and sera to Dr. Simms, but we certainly didn't send in any serum from recovered animals because we don't have any recovered animals as far as I know.

Dr. Beamer:

Our work in Illinois has been confined to making diagnoses and field identification. Our experimental work in Illinois is very limited. We handle tissues and cattle which are submitted to us for diagnosis and while we've been carrying on some histopathologic examination of this material, we submitted none to you, Dr. Maurer, because we never felt they had been well documented by the people who submitted these specimens to us. We have made one additional effort to transmit the disease without success. We've not attempted to send material from the three odd cases we have had on respiratory distress. It all came from dead animals and we thought we'd prefer to wait until we got better material.

Dr. Pritchard:

I guess that's all of it except myself. Since the time of the Purdue meeting, we've had the opportunity to conduct a little work on the mucosal disease problem. A number of cases occurred in Indiana during the past year and we have had the opportunity to study some of them.

The approach that we took to the mucosal problem was to go out into these herds during the time clinical cases were appearing. We put all the animals in the herd through a chute—sick ones, well ones—all of them. We bled them all, temperatured them, ran as careful a physical examination as we could under those conditions. By doing that, we believe that we've discovered that many animals may have subclinical infection when they actually appear to be quite normal clinically. Quite a number of these animals that are eating and look quite bright, do have marked elevation in temperature. Some of them will be 104°, 105°, and even higher when they don't appear to be too ill. We found that quite a number of these animals have small oral lesions. If we examined the mouth very carefully, we would find small lesions in the mouth, although certainly not as pronounced as those that you saw this morning. In addition, we found that many of these animals have leukopenia. Some of the animals that appeared to be perfectly normal would have white count under 2000 per $mm.^3$.

We've also been able to obtain some evidence to support the work of Dr. Ramsey where he presented evidence that this disease might be transmissible. We went into these herds and bled subclinical cases when they had leuiopenia and still did not show marked signs of disease. We took that blood and inoculated into experimental animals. In our first seven attempts to transmit the disease, we succeeded in all seven. I have a chart here which I'll pass around. In this case the temperature went up to a 106° on the

sixth day after inoculation. On the second day, it went up to 103°; the third day about the same; the fourth day about the same; the fifth day it came back down; the sixth day it went up to a 106°, and eventually came down; stayed down until about the 35th day or so; then it went up and the animal died on the 37th day.

The white count dropped somewhere around the 2nd day—it came down to about 3000 in the experimental animal; it went back up to about 7000 or 8000 and then, on the 10th day or so, it came down again; another period of leukopenia; then it went up and stayed up the rest of the period. At the time of death, it was very high, higher than normal.

We found the animal depressed on the second day and continued until about the 15th day. Lacrimation was very marked. It appeared on the second day and continued until the 20th day. A mucous nasal discharge appeared on the second day, became more voluminous and lasted until about the 20th day. Mouth lesions which were erosions appeared about the 10th day and lasted only for 5 or 6 days. Diarrhea did not appear until the 20th day, and that continued the rest of the time the animal lived. The other signs—depression, lacrimation, nasal discharge and so forth—reappear just before death. This animal died rather suddenly on the 37th day. Now this was one out of seven—the only one of the seven that died. The other six recovered and we did challenge some of these animals with our other agents and agents infected with our Indiana virus diarrhea. We have completed the cross-protection tests between the two agents and feel, at least, that there are some differences. The animals get sick from both of these agents. I think that's about all I have.

Dr. Van Houweling:

I think that's a very fine report and it certainly does indicate some real progress since last February. Are there any questions to the Committee? Is everyone clear on Dr. Pritchard's report?

Dr. Pritchard:

The material we used was from clinical cases of mucosal disease in Indiana—not Indiana virus diarrhea.

Dr. George:

Was this disease readily transmittable?

Dr. Pritchard:

It was.

Dr. Van Houweling:

Have you tried the same thing, Dr. Ramsey?

Dr. Ramsey:

We scarified the tongue and used large quantities of blood. Some of ours was just material that came in freshly dead. Tissues were taken immediately.

Dr. Van Houweling:

Have you tried early stages of the disease?

Dr. Ramsey:

We have tried some that have come into the clinic 2 or 3 days before they died.

Dr. Jensen:

Dr. Pritchard, did your inoculants come from very early stages?

Dr. Pritchard:

The doners would develop the disease; they were bled on the farm about 10 days to 2 weeks before they died.

Dr. Ramsey:

Did you have an opportunity to necropsy them?

Dr. Pritchard:

Yes.

Dr. Davis:

Dr. Pritchard, how many animals did you examine, and on how many did you pick up mucosal disease?

Dr. Pritchard:

We did not try to transmit from every one of these cases—not over two or three.

Dr. McKercher:

What was the age of the suspect animals?

Dr. Pritchard:

They have varied from about 2 months to about 14 months and the younger animals appeared to be equally susceptible, Jerseys, Shorthorns and Herefords.

Dr. Ramsey:

In this case, was the donor animal a Hereford?

Dr. Pritchard:

Yes.

Dr. Ramsey:

was this a feedlot animal?

Dr. Pritchard:

Yes, it was. It was from a group that had been started on feed not too long before.

Dr. Mulhern:

Dr. Pritchard, do you have any recovered animals from these seven?

Dr. Pritchard:

That are still on hand? Yes. I might add that we also have a few recovered ones from the farm, too, that are still present. I think what Dr. Mulhern may be alluding to was one of the recommendations of the Purdue meeting that recovered animals still be fed to where they could be challenged with known rinderpest virus. I presume that is still a good recommendation as far as this was concerned or is it still necessary?

Dr. Van Houweling:

I will ask the Committee, but any of you can speak.

Col. Maurer:

I would like to express the feeling that it is important that there still be challenges of convalescent animals in each of these groups with the other entities involved. I would also eventually like to get to see that done with the rinderpest virus as well. I don't say that with any sense of discredit in what has already been done toward the elimination of rinderpest. I think as much as has been done, is fine, but it would also be well if convalescent animals from each of these diseases could be challenged with rinderpest, and with each of the other entities in cross-protection tests.

Dr. Van Houweling:

That will be the first stage, and then cross challenge with rinderpest virus. Is that what you're suggesting?

Col. Maurer:

Yes, that is it.

Dr. Van Houweling:

We did discuss with Dr. Mitchell, when he was down here the last time, the possibility of taking him some animals and at that time, he was perfectly willing to receive some animals. We even got to the point of discussing how we would take them up there and so forth. I presume he is still willing to do that for us, so we can get recovered animals, and if it is still necessary, I'm quite sure it can be done. You don't have any, Dr. Ramsey, that you know of?

Dr. Ramsey:

Dr. Pritchard indirectly has stated that maybe we do have some and don't realize it. To answer your question directly, I do not know of any, but I think that Dr. Pritchard has suggested that probably we have had.

Dr. Pritchard:

We have quite a number of them available and also the people in North Dakota do, and we have offered them to the Department, but they have indicated that they are not able to handle them at the present time.

Dr. Marsh:

Mr. Chairman, there's a question I'd like to ask Dr. Ramsey with regard to the mucosal disease that's been described in Iowa. Has that ever been transmitted, that characteristic disease? As I understand Dr. Pritchard, you consider that you have that type of disease; that you did transmit it? I haven't heard of any other report. Is that correct?

Dr. Van Houweling:

I asked Dr. Ramsey, and he said the results were inconclusive as far as Iowa was concerned at this time.

Dr. Ryff:

Nobody else has?

Dr. Van Houweling:

Do you know of anybody else, Dr. Ramsey or Dr. Pritchard?

Dr. Ramsey:

No, I do not.

Dr. Marsh:

The reason I bring that point up in generalized discussion today is because it's been indicated that probably the Indiana disease and the Iowa mucosal disease might be the same or at least considered as one disease,

and the results of Dr. Pritchard's discussion indicated that we may have two different diseases there. I thought the clinical pictures were different in description. We think we have the disease which Dr. Ramsey described. Our transmission attempt failed, but we may not have had the animal from the right stage. I was interested in that because I think we may have considered two types of the disease, and still, we may have three.

Dr. Van Houweling:

I think Dr. Pritchard also said--check me if I'm wrong--that you subsequently challenged the animals that recovered from the mucosal disease with your agent and you brought them down which would indicate that they were susceptible to the other after they had gone through an attack of the true mucosal.

Dr. Beamer:

I'd like to say again that we've made three attempts to transmit mucosal disease and have been unsuccessful. As previously indicated, these attempts were made with material from dead animals. We have been hoping to repeat these trials with fresh material but so far have not had the opportunity.

Dr. Van Houweling:

Dr. George.

Dr. George:

I took Dr. Olsen, of the University of Nebraska, quite a number of specimens. He was unable to transmit it, however.

Dr. Van Houweling:

I'd better be careful here, I'll get beyond my knowledge of research, but I might say that it has been reported to me by Dr. Mott and some of the others that have done some work on VE, that there is a difference in the amount of take you get, according to the amount of exposure you give, if you are using blood. Now, check me, Dr. Mulhern, I know you're familiar with this--but in cases where they use blood from recovered pigs, 10 cc. would give no response and 25 cc.--I may not have the figures exactly right--a slight temperature elevation, and then, 100 cc. would actually bring the animal down with clinical symptoms of more marked effect. Is that right?

Dr. Mulhern:

I don't know.

Dr. Van Houweling:

Who does? I'll tell you how I happened to be interested in that. We

were talking about testing some semen for import from countries where they have rinderpest, foot and mouth disease and so forth, and that's why it came up. They could test a cc. of semen, but they wouldn't want to guarantee that if you used a whole 10 cc. of semen, you wouldn't get a take. Based on that work, I thought you'd be familiar with it.

Dr. Mulhern:

The only thing that I'm familiar with is the concentration. We've talked about the concentration of the virus incubation period down to where we couldn't get anything.

Dr. Van Houweling:

Dr. York.

Dr. York:

As far as blood is concerned, I think it is pretty well assumed by a number of people you can't get results with too much blood. In fact, it will do more harm than good. Sometimes you get better results with far less. I'd like to have Dr. Pritchard comment on what he observed--whether a number of animals with habitual fever, perhaps, or leukopenia without clinical findings, whether some of those never gave any clinical findings.

Dr. Pritchard:

Some of them recovered or never developed signs, and some of them developed typical signs.

Dr. York:

I would like to make a comment. In a number of herds, 2 or 3, I believe, where we were checking on mucosal disease as described by Dr. Ramsey, if you question the owner very, very carefully you find that maybe a week or more earlier, a number of animals in the herd were off for a couple of days. I think that one of the very important points that I'd like to emphasize here is that a large number of animals may have very mild infections and yet there may be only a few clinical cases in the herd.

Dr. Van Houweling:

I was going to say too, that I'm quite sure that Dr. Mott told me that about VE, and, of course, it's dangerous to draw conclusions from one disease as compared to another. The same isn't always true even though they're both viral diseases, though it could be true in one case. Is there anything else? We've gotten in a pretty good discussion on this.

Dr. Davis:

I'm wondering if a second passage attempt has been made by Dr. Ramsey and some of these other men working with mucosal disease after the disease was well developed.

Dr. McKercher:

We actually tried that earlier when we were using blood as an inoculant, and, on second or third subpassage, we got no reaction.

Dr. Van Houweling:

The Committee I appointed this morning, Drs. Schneider, Pritchard, Maurer, Brown, Mulhern, Jensen, McKercher and Marsh, I believe, have their report, and we'll be glad to have that now, Dr. Schneider.

Dr. Schneider:

We started this out with two conference resolutions, and then we have some recommendations. I've asked Col. Maurer to read the recommendations but we'll go over the conference resolutions first. We want you to understand that these were just our thoughts as we proposed them there in a very brief amount of time from what we've been able to gather here this afternoon. Certainly, anything that we've done is subject to revision by the group.

Recommendations:

Numerous reports and two national meetings have established the presence and economic importance of two new groups of cattle diseases in the United States. These two groups of diseases have similar clinical features and lesions within each group and have been descriptively named Mucosal Disease (Iowa), Viral Diarrhea (Indiana), Viral Diarrhea (New York) in the first group, and Upper Respiratory Tract Disease of California and Rhinotracheitis of Colorado in the other group. Although they have been experimentally transmitted, the etiologic agents have not been identified. They have occurred in over 20 states and hundreds of animals have been infected. Research work on these diseases, prompted by local need, has been done on a local basis with slight opportunity for comparison of one disease with another.

Left to local necessity and the chance presence of adequate research facilities in the various states, the research effort may not be applied to each disease in proportion to its national importance. Some may receive but little study and the information required for accurate differential diagnosis may be acquired very slowly. So long as unidentified diseases are prevalent in the country there is not only the hazard from them, but from similar, more serious infectious exotic diseases which may gain a foothold.

Dr. Schneider:

Those are our two basic recommendations in regard to the conference resolutions. With regard to specific instructions or recommendations, Col. Maurer, if you would like to read those three, then we can open up for discussion.

Col. Maurer:

We have rather looked upon what Dr. Schneider has read as background and reason for recommendations that we've made up as follows:

Conference
Resolutions:

I. That every effort should be made to promote and obtain funds for the support of local and regional research which will provide for each disease; information on its c inical and pathologic character, the identity of the etiologic agent, its diagnosis, and eventually on its prevention and control.

II. Recommend the election of an help provide support for two laboratories presently engaged i n work on these diseases which have facilities, personnel, and interest in se ving as central laboratories for the differential diagnosis of these diseases; one laboratory to deal with the VD - mucosal disease group, the other with the Upper Respiratory - rhinotracheitis group of diseases.

Such laboratories should be capable of developing conclusive methods for the differential diag oses of the diseases involved through the application of serologic and pathologic techniques. It should also serve as a consulting laboratory to other laboratories concerned with differential diagnosis.

In the event that no existing laboratories can be made available to adequately provide these services, that efforts be made to obtain a new central research laboratory equipped and staffed to provide these services.

III. Recommend the appointment by the Animal Disease Eradication Branch of Agricultural Research Service of a national coordinating committee whose mission will be briefly to:

1. Promote and help provide funds for local and regional research by existing workers.

2. Explore the availability of existing laboratory facilities and personnel which could serve as the central research laboratories or make recommendations for a new central laboratory.

3. Assist and help coordinate the work between the central laboratories and the local laboratories.

4. Collect and aid the exchange of information between workers and control agencies.

5. As definitive methods of differential diagnosis become available, obtain incidence and distribution figures on each condition.

We feel that we have reason for these recommendations. I expect some discussion, and we will be happy to receive it and provide as best we can, the reasons why we made these recommendations.

Dr. Van Houweling:

Do you have anything further, Dr. Schneider?

Dr. Schneider:

No.

Dr. Van Houweling:

Is there discussion of the recommendations from the committee? You might want those read again. It's pretty hard to get--would you like to have the specific recommendations read again? You don't need to read them again if everybody is satisfied.

Col. Maurer:

It might clarify this just a bit to say extemporaneously that the first one simply recommends that this group go on record as promoting research by existing groups now doing research. Second, that we felt in order for all of us to be sure of final results and to get results that will stand up over a period of years, we want to be sure that the methods of differential diagnosis are so standardized and so sound that there will be no question of the results. And too, if there is some sort of central consulting laboratory where a local laboratory can send an agent, it is working with for positive identification, it would be a help to everyone concerned. Third point was that in order to coordinate the work between local laboratories and the central laboratory, and to aid in the dissemination of information between the laboratories, it would be helpful to have a small group of people which would include a federal man with funds for travel and transportation of specimens.

Dr. Van Houweling:

I think that's a good explanation of the recommendations. Are there any questions in regard to that?

Dr. York:

I think there is very obviously a need for one or two or three laboratories. However, the committee didn't point out that we're a long ways from the point where such a central laboratory could make a differential diagnosis, even if we had the funds to set up a laboratory.

Dr. Jensen:

The committee recognized that differential diagnoses are very difficult at this time, and that these other phases of the problem should be resolved before differential diagnoses can be accomplished.

Col. Maurer:

If I might add, the actual wording, Dr. York, was that the function of such a central laboratory as written here was "Such a laboratory should be capable of developing conclusive methods for the differential diagnosis of the diseases involved."

Dr. York:

But you use t e singular though, rather than the plural.

Col. Maurer:

Oh well, tha' is lack of editorial elegance here in 15 minutes work. The plural was i tended.

Dr. Van Hou eling:

I don't know if we need a motion to adopt these recommendations, but, perhaps it would be in order for the Chairman, if he wishes, to move that they be adopted.

Dr. Schneider:

The Chair will accept a motion from the board--the motion has been made by Dr. George and seconded by Dr. Rasmussen.

Dr. Van Houweling:

All those in favor that the resolutions and recommendations be adopted as read, please indicate by the usual signs, (Aye). It's been suggested to me, one thing we haven't discussed that we might have discussed a little is, a matter of how rhinotracheitis is being treated in this area with apparent success as far as preventing death losses is concerned. Maybe we could call on Dr. Pierson of the Clinical Staff, Colorado A & M, to give a little discussion of the treatment being followed.

Dr. Pierson:

My experience in the treatment of rhinotracheitis has been quite limited. Though I don't talk with any amount of authority, you might be interested in an experience I had in the treatment of a rather typical outbreak of rhinotracheitis where I was able to observe the response to treatment, if any. That particular outbreak involved a hundred head of feedlot animals with the characteristic symptoms of rhinotracheitis present. I talked the owner of the feed lot into letting me treat this herd in the manner in which we might derive some benefit as to the value of treatment. He left the treatment of this herd entirely up to me. Briefly, what we did was to divide this herd in half. One half we treated and the other half we did not treat. We took temperatures of the animals that we treated, and identified these animals with ear tags so that we could follow the progress of the treatment.

The half that we treated were again divided in half; the animals that were showing the greater temperature rise were treated with a broad spectrum antibiotic intravenously, along with sulfanilamide orally. Those in which the temperature rise was not too great (103-107.5°), were treated with a sulfanilamide orally only. Our results were interesting. In the animals that we treated with antibiotics plus a sulfanilamide orally, the temperatures dropped a degree daily for 3 days; in those that we treated with a sulfanilamide orally only, the temperature remained about the same. Clinically,

both groups of animals in which treatment was started, showed clinical improvement daily. There was no greater improvement clinically, however, in those animals that were treated with broad spectrum antibiotics and the sulfanilamide from those that received the sulfanilamide alone. But what was more interesting to me than any of these observations was the fact that the animals which were not treated at all showed an equally quick improvement. In other words, the observations that I made from this one herd, was that the treatment was of no significance whatsoever. We had an occasion to treat chronic cases in which there was a great deal of dyspnea present. The dyspnea was due to the great amount of exudate in the trachea. These cases were treated with some enzyme preparations. We used pancreatic "Dornasp" on some; "Triptar" in some others. Our results were dramatic. Some animals were showing terrific respiratory embarrassment. In a matter of a few minutes to an hour, the breathing of these animals returned almost to normal following the use of the enzyme preparations injected into the trachea. We used this enzyme preparations mixed with about 10 cc. of diluent injected directly into the trachea, using a 14-gage needle. The end of the needle was occluded, and then a series of small holes were made in the needle so that when we injected this enzyme through the needle, it would spray the enzyme into the trachea. While our experience with this enzyme has been very limited, we are very encouraged with the results that we've obtained so far.

Dr. Van Houweling:

Thank you, Dr. Pierson. Anybody else want to report or discuss a treatment of this condition here in Colorado?

Dr. Chow:

I might comment on Dr. Pierson's thinking. The one thing we should emphasize is diagnosis, and he mentioned the chronic cases. We tried more than 10 of them and everyone recovered. One thing I should point out is this, the diagnosis should be pretty sure before this treatment is given. It should be made clearly a chronic rhinotracheitis, not other diseases. I realize that some of the veterinarians here are trying to use this preparation of enzyme with which they couldn't get any result. The clinical diagnosis between certain stages of diphtheria and some other diseases is difficult; they might show the same kind of embarrassment of breathing; so what we are now doing, or Dr. Pierson is doing, is to check it carefully and make sure it is a chronic rhinotracheitis before treatment is given.

Dr. Van Houweling:

Does anybody else have any comments on the treatment? If not, let's spend a minute or two of discussing what's on this board. If you want to do that, Dr. Pritchard? I guess it is self-explanatory except for just explaining briefly what the symbols are there.

Dr. Maurer:

I'd like to make a motion in reference to the committee. As most of you know, there was a committee appointed at Purdue; there was another committee appointed today. It is apparent that there is quite an overlap of personnel in those two committees. Furthermore, this one appointed today has essentially the same objectives as the Purdue committee. It seems as if it might be less unwieldy and a little more efficient to consolidate these two groups into one working or consulting committee to represent both the Purdue and the Denver meetings. It happened very wisely, through the appointments, that the new men added today, are men who represent the western part of the country: Dr. Schneider from Idaho, Dr. Jensen from Colorado, Dr. Marsh from Montana--the portion of the country which was not, for the most part, represented on the Purdue Committee. Also there is Dr. Mulhern who is the representative of the Eradication Branch. Those, then would be added to the original Purdue committee which consisted of Drs. Pritchard, Maurer, McKercher, Deemer, York, Mott and McEntee. So I would like to make a motion that the two committees be consolidated into one.

Dr. Van Houweling:

I presume that it would be in order for this group to act on such a motion, if there is no objection on the part of the Purdue Committee. I don't imagine we can quite do this, if there is an objection because it was another conference that instigated that committee. Now there is a motion. Is there a second?

Dr. Ramsey:

Second the motion.

Dr. Van Houweling:

Shall we deal with it that way? Is there any objection on the part of anybody on the Purdue Committee? They're all here but two, I believe. If not, I think it would be in order to consider that motion and I believe too, it might make it more expeditious in dealing with some of these things from the standpoint of those who are working with them. Are they any discussions or motions? If not, all those who are in favor can indicate by saying aye. (Aye). Opposed? No word.

A field trip for tomorrow morning has been arranged by Dr. Brown. The group will visit the Greeley area to observe clinical cases. A case of rhinotracheitis will be obtained for autopsy purposes for the benefit of the visitors.

I'd like to have just about 5 minutes here with the State Veterinarians that are here and the Federal Officials. If you'll just stay right here and come together for a minute, we'll be adjourned. I want to express my thanks again to Dr. Davis and his staff and all the people who had assigned portions in the program and all the others who participated. I think it has been an excellent conference, and my sincere thanks to you all.

CONFERENCE ATTENDANCE

C. D. Van Houweling, Chairman presiding
Agricultural Research Service, USDA — Washington, D. C.
C. L. Davis, Davis, Director
Animal Disease Research Lab., ADP, ARS — Denver, Colorado

W. A. Anderson	ADRL, ADP, ARS	Denver, Colorado
P. D. Beamer	University of Illinois	Urbana, Illinois
Maxine M. Benjamin	Colorado A & M College	Fort Collins, Col.
H. Breen	Wyoming State Vet. Laboratory	Laramie, Wyoming
Wm. Brown	Colo. Cattle Feeders Ass'n.	Fort Collins, Col.
J. W. Childs	Colo. State Veterinarian	Denver, Colorado
T. L. Chow	Colorado A & M College	Fort Collins, Col.
R. T. Clark	APH, ARS	Denver, Colorado
E. S. Cox	ADE, ARS	Denver, Colorado
A. W. Deem	Colorado A & M College	Fort Collins, Colorado
J. L. George	Nebraska BAI	Lincoln, Nebraska
M. W. Glenn	University of Wyoming	Laramie, Wyoming
L. A. Griner	Colorado A & M College	Ft. Collins, Colorado
Rue Jensen	Colorado A & M College	Fort Collins, Colorado
D. G. McKercher	University of California	Davis, California
Hadleigh Marsh	Montana State Veterinarian	Helena, Montana
F. D. Maurer	AFIP	Washington, D. C.
N. J. Miller	Practitioner	Eaton, Colorado
C. K. Mingle	ADE, ARS	Washington, D. C.
A. W. Monlux	ADRL, ADP, ARS	Denver, Colorado
F. J. Mulhern	ADE, ARS	Washington, D. C.
Robert Pierson	Colorado A & M College	Fort Collins, Colorado
W. R. Pritchard	Purdue University	LaFayette, Indiana
F. K. Ramsey	Iowa State College	Ames, Iowa
J. E. Rasmussen	ADE, ARS	Cheyenne, Wyoming
J. F. Ryff	Wyoming State Vet. Laboratory	Laramie, Wyoming
H. E. Schaulis	ADE, ARS	Denver, Colorado
A. P. Schneider	Idaho BAI	Boise, Idaho
T. E. Traylor	ADE, ARS	Denver, Colorado
D. F. Werring	ADE, ARS	Lincoln, Nebraska
D. L. Williams	ADE, ARS	Atlanta, Georgia
C. J. York	Pitman-Moore Company	Indianapolis, Indiana